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DAMAGE TOLERANCE EVALUATION OF THE ANTI-CAMOUT RIB (ACR) TORQ-SET RECESS FASTENERS

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WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

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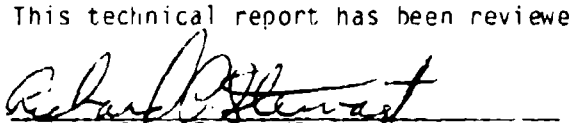

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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This report describes the latest effort in the continuation of the Air Force's technical evaluation of aerospace fastener recesses. Earlier work had investigated the prototype Anti-Camout Rib (ACR) recess design, i.e., one rib on each removal wall of the recess and the driver bit. This test program, at the request of the Secretary of Defense, evaluated the production configuration with multiple horizontal ribs on each removal wall of the driver bit and one vertical rib on each removal face of the fastener recess.

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This effort was confined predominantly to the damage tolerance testing of the following recess/driver bit combinations: (a) standard Torq-Set recess and standard Torq-Set driver bit, (b) ACR Torq-Set recess and ACR Torq-Set driver bit, (c) ACR Torq-Set recess with standard Torq-Set driver bit and (d) standard Torq-Set recess with ACR Torq-Set driver bit. Limited tests of the Torx recess fastener modified with 5° taper on the side wall of the recess were also conducted. This test program was coordinated with and approved by the Army and Navy.

Besides the testing of the recesses, this effort was expanded to determine the cost and service benefits of the Anti-Camout Rib on the Torq-Set recess.

The test results, as well as the cost studies, indicate that the ACR Torq-Set recess combined with the ACR Torq-Set driver bit demonstrated best overall performance of the four combinations, while the ACR Torq-Set recess with standard Torq-Set driver bit and the standard Torq-Set recess with ACR Torq-Set driver bit combinations offered some improvement when compared to the standard Torq-Set recess and standard Torq-Set driver bit combination. All combinations of standard and ACR Torq-Set recesses and driver bits were found to be fully interchangeable.

FOREWORD

This report describes an in-house evaluation conducted by personnel of the Aeronautical Systems Division and the Wright Aeronautical Laboratories, Flight Dynamics Laboratory. In the Aeronautical Systems Division, the work was carried out under Program Element 64212F, Project 2098, Task 5.

The work reported herein was performed during the period of 1 June 1981 through 1 February 1982, under the direction of the author, Mr. Richard P. Stewart.

The author wishes to thank Messrs Jack Smith and Larry Bates who were responsible for conducting the tests; Mr. Harold Stalnecker for providing support and technical guidance; Messrs Juan Acaron and Gene McPherson for their computer programming and data analysis; and Mr. Augustin Sanchez, Miss Mary Ann Rotterman, Miss Shawn Hall, and Mrs. Cathy Kibler for their assistance in the preparation of the report.

Major Maynard Ford of ASD's Life Cycle Cost Management Division contributed to Section VII, Cost Analysis.

The following companies are owed a special debt of gratitude for providing the test samples and their technical support:

Air Industries Corporation

Apex Machine and Tool Company

Defense Logistics Agency/Defense Industrial Supply Center

General Dynamics Corporation

Grumman Aerospace Corporation

Phillips Screw Company

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GLOSSARY OF TERMS

Camout - The application of torque to a recess until a complete disengagement occurs between the bit and the recess. This torque application usually damages the recess, bit, or both, depending on the type of recess, end load, etc.

End Load - The force with which the bit is pressed into the recess while removal or installation torque is applied.

Freezing - When a fastener is installed and cannot be removed with convenient tools and bits.

Off-Angle - The angular offset or misalignment between the axis of the screw and the axis of the bit.

Seizing - Similar to freezing, but usually due to a material incompatibility and/or lack of sufficient lubricant to allow normal removal.

Shear Head - A fastener with a smaller than "normal" head which is used where shear forces are predominant. Usually the head is the same as the head of the next smaller shank diameter tension head fastener.

Tension Head - The "normal" dimensioned head size which is used where both shear and tension forces can cause failures.

Torq-Set - An offset-cruciform recess, readily forged in fastener heads, the planform in which the four driving faces intersect at a common point. A registered trademark product of the Phillips Screw Company.

Anti-Camout Rib Torq-Set - Similar to the Standard Torq-Set recess except includes a single vertical rib on the removal walls or faces of the fastener and multiple, horizontal ribs on the removal sides or walls of the driver bits. During removal, the ribs interlock and provide an anti-camout feature. A proprietary and registered trademark product of the Phillips Screw Company.

Tri-Wing - A three wing conical design with a center radius which acts as a drill center to facilitate drillout. A proprietary and registered trademark product of the Phillips Screw Company.

Torx - A vertical walled, flat, or round bottom recess with six rounded lobes used as the driving surfaces. Since the walls are vertical, no end load is required. Torsional forces are reacted through a larger area than points or corners. A proprietary and registered trademark product of Camcar Division of Textron Company.

SECTION I

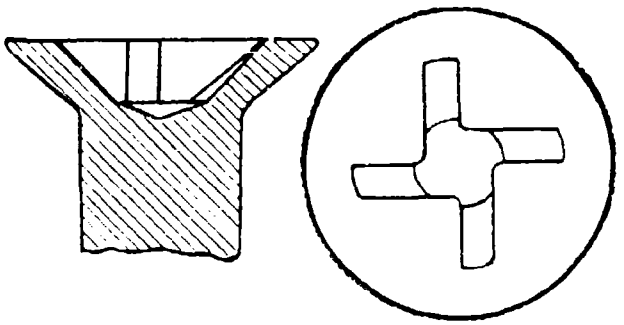
INTRODUCTION

The test effort described and discussed in this report is a continuation of the Air Force's technical evaluation of aerospace fastener recesses. Previous work was reported in ASD-TR-78-5 and AFFDL-TR-78-22. The earlier work had investigated the prototype ACR design, i.e., one horizontal rib on each removal face of the driver bit and one vertical rib on each removal face of the fastener recess. This program evaluated the final configuration of multiple horizontal ribs on each removal face of the driver bit and one vertical rib on each removal face of the fastener recess.

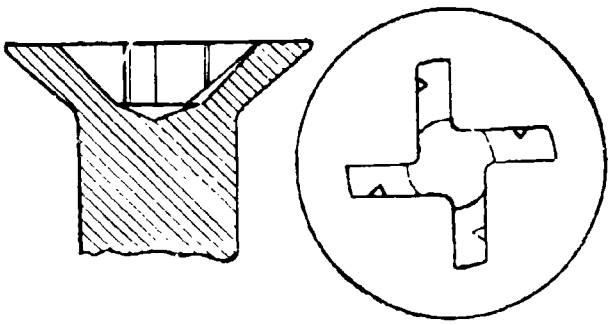
This technical effort was confined to the damage tolerance testing of the Torq-Set and ACR Torq-Set recess fasteners, and limited tests of the Torx recess fastener modified with 5^{0} taper on the side walls of the recess to provide improved offset driver/ bit engagement. These recesses are shown in Figure 1.

Subsequent to the initiation of the planning for this program, the Secretary of Defense directed the Air Force to take the lead in getting a coordinated test plan established to resolve whether or not the Department of Defense (DOD) should standardize on the ACR Torq-Set recess fastener. This effort was therefore expanded to also encompass the cost benefits of the Anti-Camout Rib feature on the Torq-Set recess. The test program consequently gained a high level of interest as reflected in the list of organizations shown in the Appendix whose personnel observed or participated in some segments of the testing. This test program was coordinated with and approved by the Army and Navy.

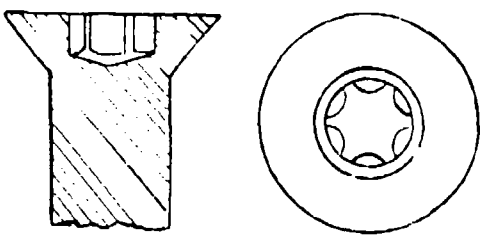
This evaluation examined one particular design feature, i.e., determine



MS33781 STD TORQ-SET RECESS



MS14191 ANTI CAM-OUT RIB (ACR) TORQ-SET RECESS



NAS 1800, MODIFIED TORX RECESS

Figure 1. Styles of Recesses Tested

the damage tolerance attributes, if any, of the Anti-Camout Rib Recess in the Torq-Set fasteners. A fastener system selection should not be predicated solely upon the results presented in this report but should additionally consider the performance characteristics of the candidate fasteners for the intended application. Design characteristics such as tensile strength, shear strength, bending strength, fatigue, application environmental effects such as corrosion tolerance, clean-out capability, and other adverse conditions such as paint in the recess, off-angle drive, wrong size driver bit, etc. must be evaluated in consonance with the specific application.

SECTION II

TEST PLAN

The testing was conducted in accordance with the following test plan, coordinated with Air Force Systems Command, the Army and the Navy.

Test Requirements for Torque Testing the Anti-Camout Rib (ACR) Feature of the Torq-Set Recess to MIL-STD-1761.

1. A first torque followed by a second torque using one driver bit/one bolt when possible, shall be tested. If the driver bit breaks, another one shall be used in its place even if it happens between first and second torque. The test procedures of Air Force MIL-STD-1761 are to be followed.
2. Combination of recess configuration vs recess driver in order of priority:
    a. Ribbed recess vs ribbed driver
    b. Standard recess vs ribbed driver
    c. Ribbed recess vs standard driver
    d. Standard recess vs standard driver (for control)
3. Size of bolts to be tested in order of priority:
    a. 0.190 inch diameter
    b. 0.250 inch diameter
4. The bolts shall be made from the following material:
    a. Cadmium plated alloy steel 160-180 KSI
    b. A-286 Cres steel 160-180 KSI
5. The following end load shall be applied:
    a. 20 lbs for 0.190 inch diameter
    b. 40 lbs for 0.250 inch diameter
6. An offset angle of 0^{o} shall be used.

7. The recess shall be unpainted and the driver bits new.

8. Dimensions for the ribbed driver bits and recesses shall be specified. (Phillips Co. drawings)

Note: A minimum of five specimens are to be tested for each case. (Per MIL-STD-1761)

9. Number of specimens to be tested:

Test Matrix:	Recess, specimens	Driver bit, specimens
	Rib, 7	Rib, 7
	Std, 7	Rib, 7
	Rib, 7	Std, 7
	Std, 7	Std, 7

For two materials, two shank diameters, tension head bolt

	# of Bolts		# of Bits	
	Std	Rib	Std	Rib
0.190 in. dia.	14	14	14	14
0.190 in. dia.	14	14	14	14
0.250 in. dia.	14	14	14	14
0.250 in. dia.	14	14	14	14

Note: Shear head bolts may be tested later using the same specimen breakdown.

The following deviations from the established plan were required:

1. Limited 4^{o} offset angle testing was accomplished in addition to the 0^{o} offset angle testing.

2. Five test specimen replicates in lieu of seven replicates were tested due to limited supply of fasteners.

3. With few exceptions, a new driver bit was used for each torque

application.

4. Ten lbs end loads were applied to the .190 inch diameter fasteners; 20 lbs end load were applied to the .190 and .250 inch diameter fasteners; 40 lbs end loads were applied to the .190 inch diameter fasteners.

SECTION III

TEST EQUIPMENT

Two separate pieces of test equipment were used in this test program to accomplish the testing in a relatively short time period. A modified Sturtevant Torque Test Fixture Model TTF-1/2 was borrowed from the Phillips Screw Co. The modification consisted of the addition of bearings in lieu of the hand crank to allow for vertical travel as well as torsional rotation. Various end loads were applied vertically to allow unrestrained camout. Fixed wedge blocks easily slid under the screw holding fixture to provide the desired offset angle for torque application. The test machine is shown in Figure 2. The electronic torque wrench used on top of the axial spindle was a GSE Model 1140-50 serial No. 044, capacity 0-600 lbs - in. calibrated on 6 January 1979. The data was observed on a peak holding, five memory indicator-recorder, GSE Model 229-D, serial No. 1121, calibrated on 20 January 1980. All the data was recorded by the Flight Dynamics Laboratory computer data acquisition system.

The other piece of test equipment was the AFWAL/FDL designed and built machine described in the reports referenced in Section I. This test machine shown in Figure 3 was specifically designed for recess testing. The machine simulates in the laboratory the hand held speed handle used in the field. This machine employs an off-the-shelf speed handle driven by a lead screw through a nut and connecting rod. The lead screw is turned by a reversible 1/15 hp electric motor. Torque is measured by a strain gage extension on the speed handle. An electronic control box allows torque limits to be set in either clockwise or counterclockwise directions. A cycle counter is also included. Torque was measured on a digital voltmeter calibrated to read

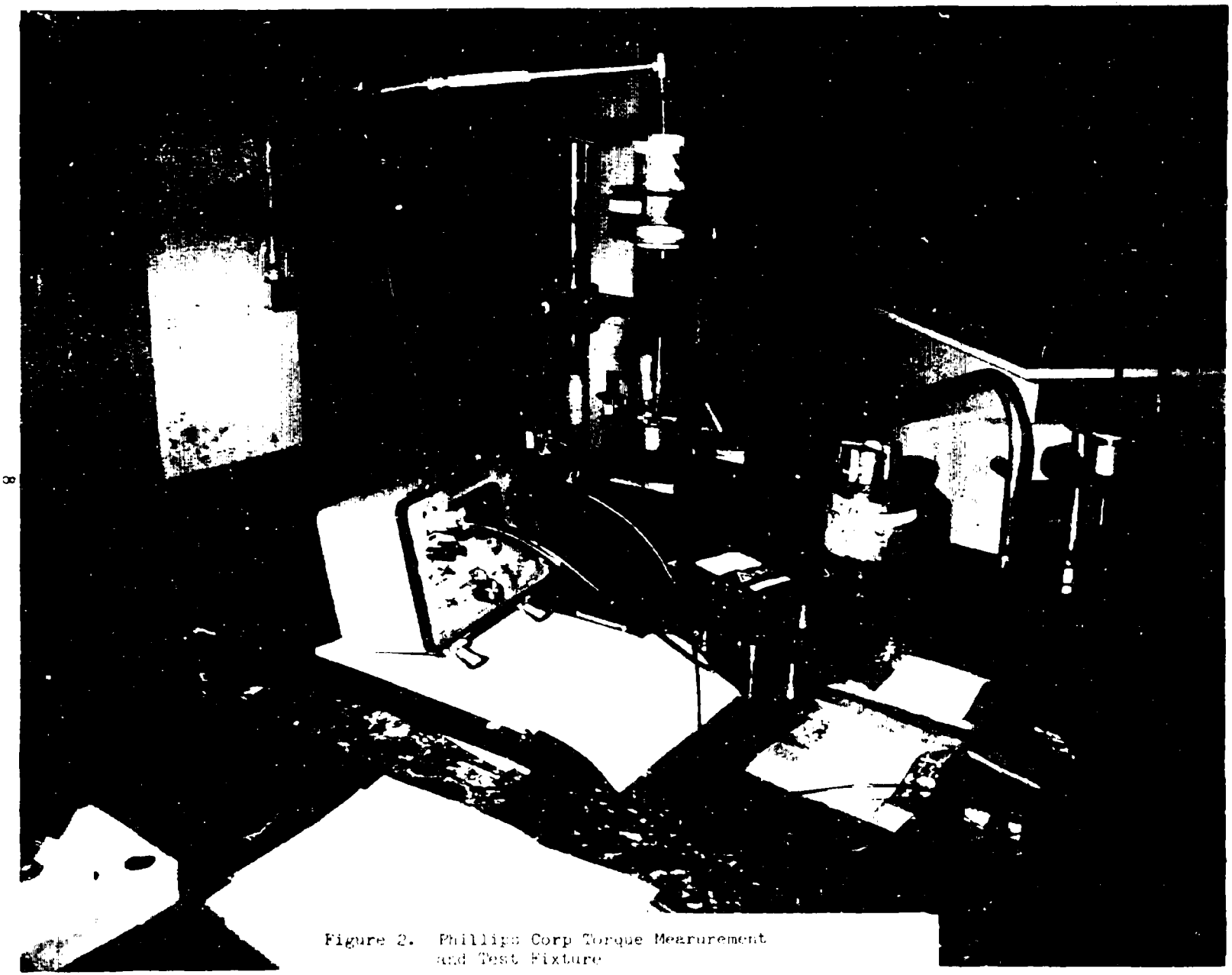


Figure 2. Phillips Corp Torque Measurement and Test Fixture

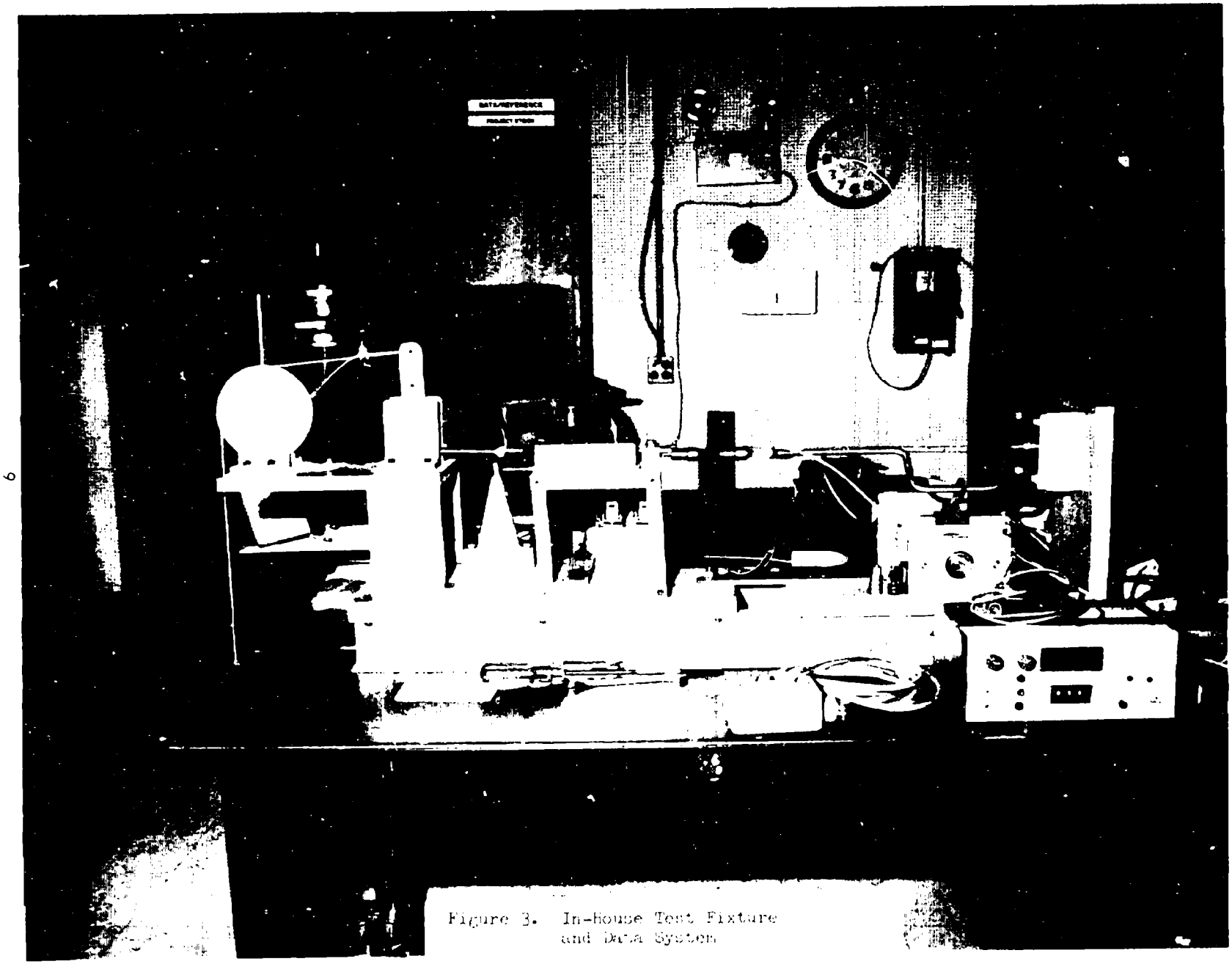


Figure 3. In-House Test Fixture and Data System

directly in inch-pounds; an oscillograph also monitored the torque applications. With the butt end of the speed handle mounted in a rubber block, flexibility encountered in service applications was simulated. The base of the equipment holding the handle was adjustable to allow an offset angle to be introduced. The protractor to measure the offset angle can be seen in Figure 4. End load is applied by a mechanical dead weight acting through a cable, pulley, and bell crank system. The weight is reacted by the fastener mount. The mount is hinged at the four corners to allow horizontal motion and permit the fastener to be backed away from the driver. This was done to duplicate the driver camout action. The fastener itself was held between two hardened steel blocks with a vee groove in each block. The blocks were firmly clamped together with two 3/8 inch diameter hex head bolts to prevent rotation. This allowed a pure recess investigation without any influence from torque/tension relationships, thread fit, lubricants, etc. The actual end load was measured prior to mating the fastener and driver. This was accomplished by inserting a load cell in the holding fixture as shown in Figure 4. The data recorded with the test equipment was found to be comparable to those obtained with the hand held speed handle but parameters such as end load, angle, and torque could now be closely controlled with the person taken out of the loop. This test method was designed to (a) measure the torque applied to a recess by a driver bit; (b) allow a preset constant end load to be applied and (c) allow a preset bit offset with the driver and recess engaged. As with the modified Sturtevant machine, the torque data was measured by a strain gage on the adapter next to the driver bit and fed into the same data acquisition system. Since two separate test machines were utilized, calibration curves were developed for data correlation.

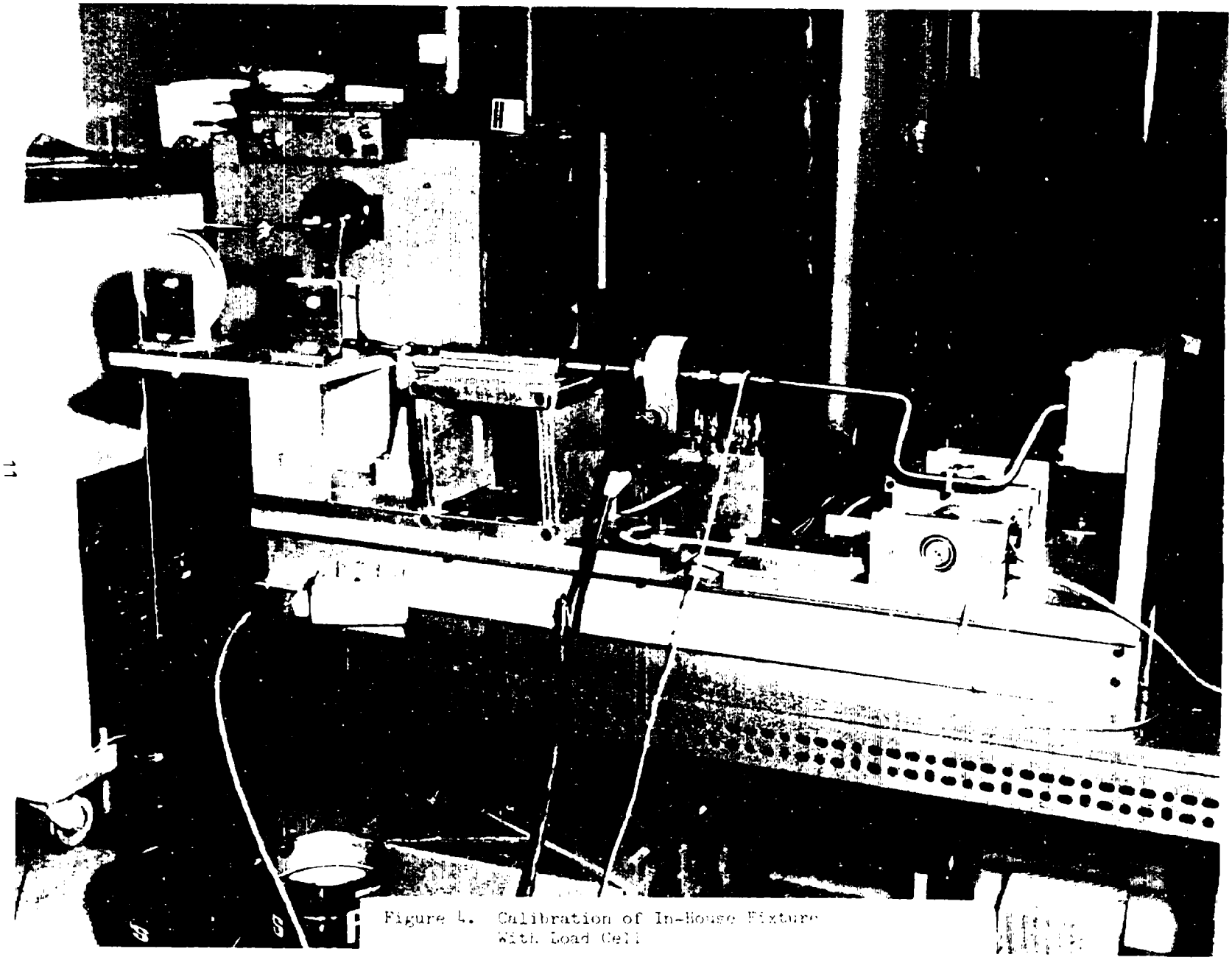


Figure 4. Calibration of In-House Fixture with Load Cell

Figures 5 through 8 are the calibration curves for both test machines. The channel numbers 6 and 7 correspond to the modified Sturtevant machine and the AFWAL/FDL machine, respectively, and are the data channels used in the Flight Dynamics Laboratory computer. As can be seen, very good correlation was maintained from 0 in-lb to 450 in-lb with three different operators, one laboratory technician, one Air Industries Corporation representative, and one Phillips Screw Company representative.

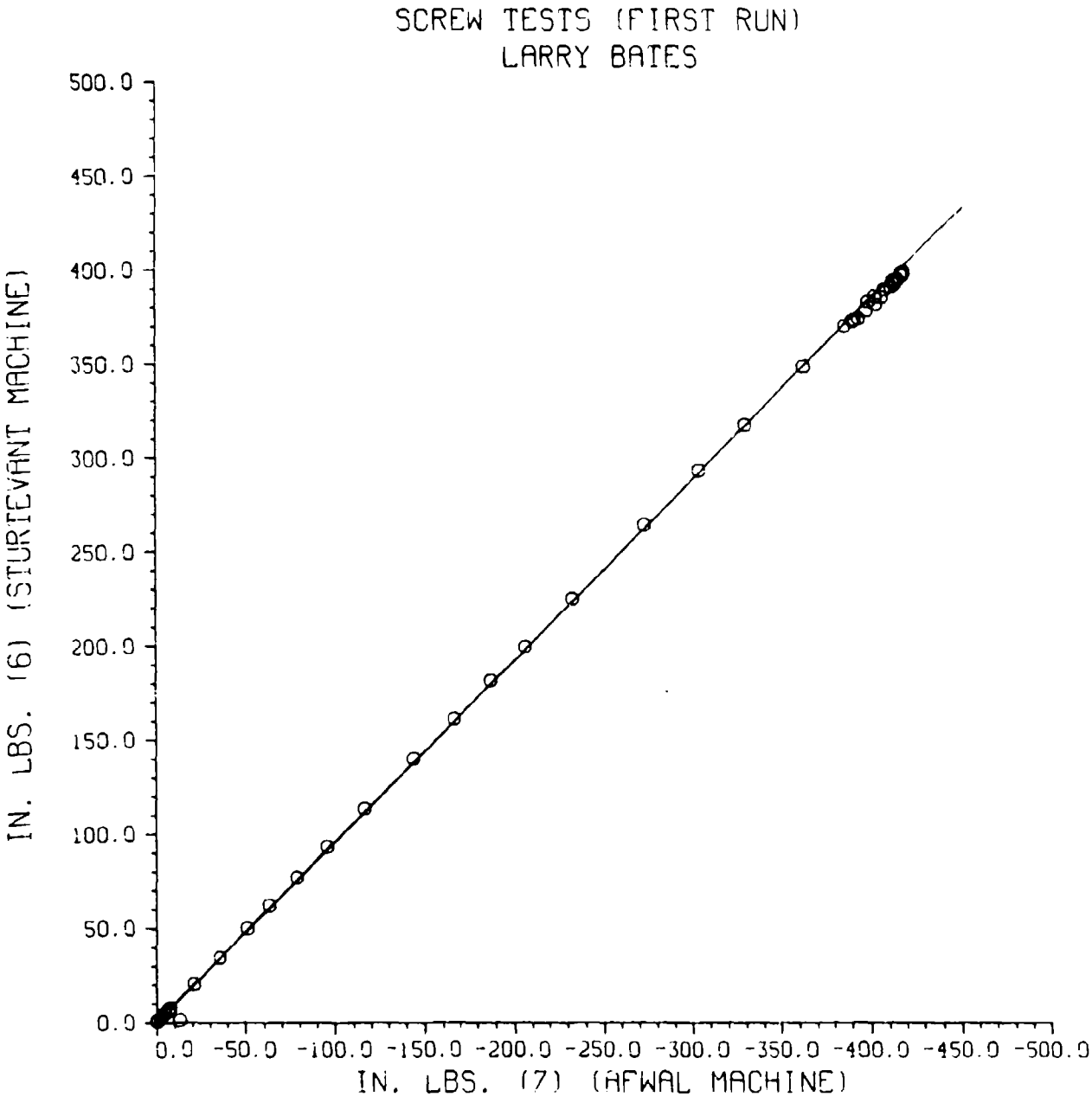


Figure 5. First Run Calibration Check

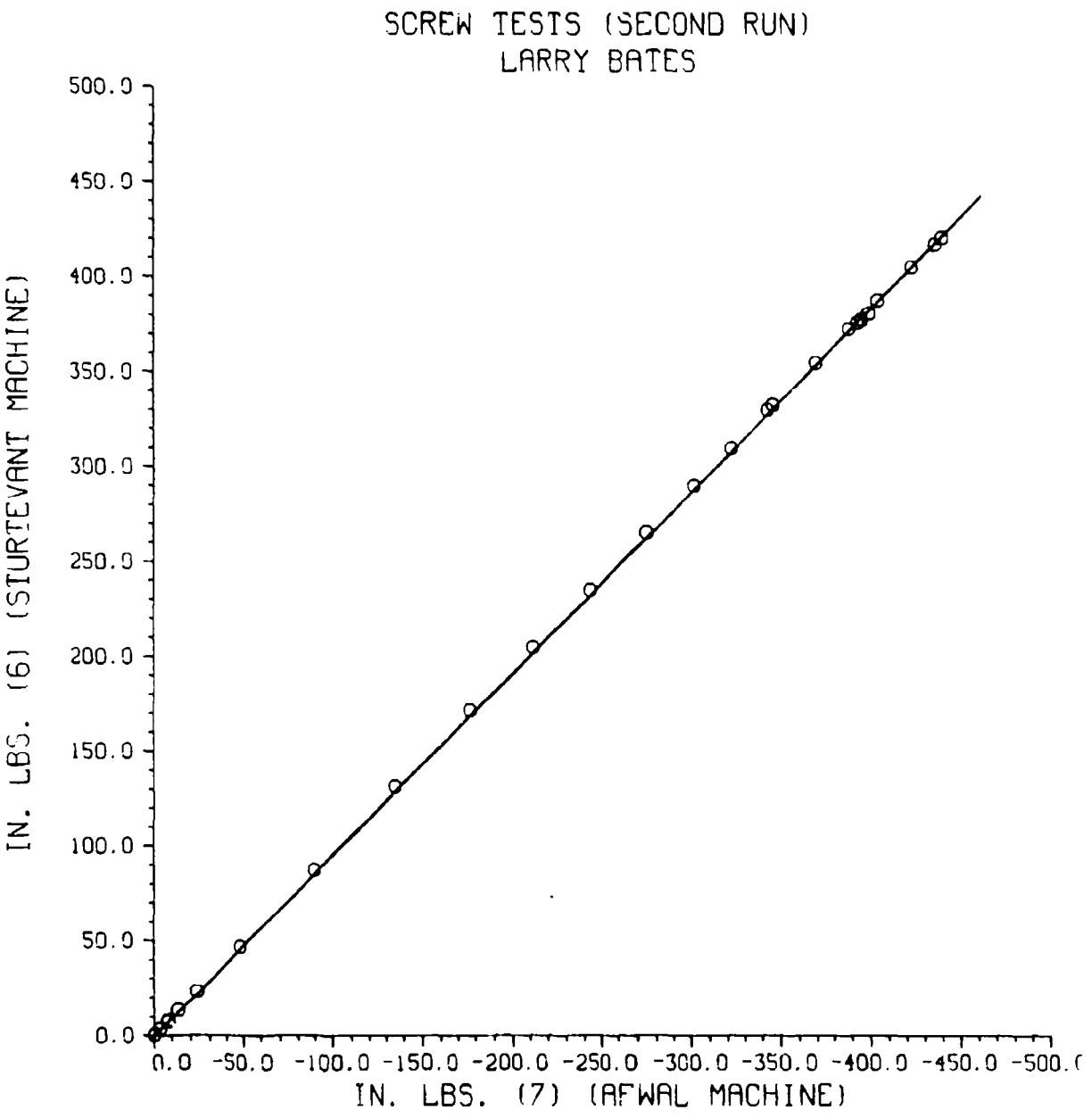


Figure 6. Second Run Calibration Check

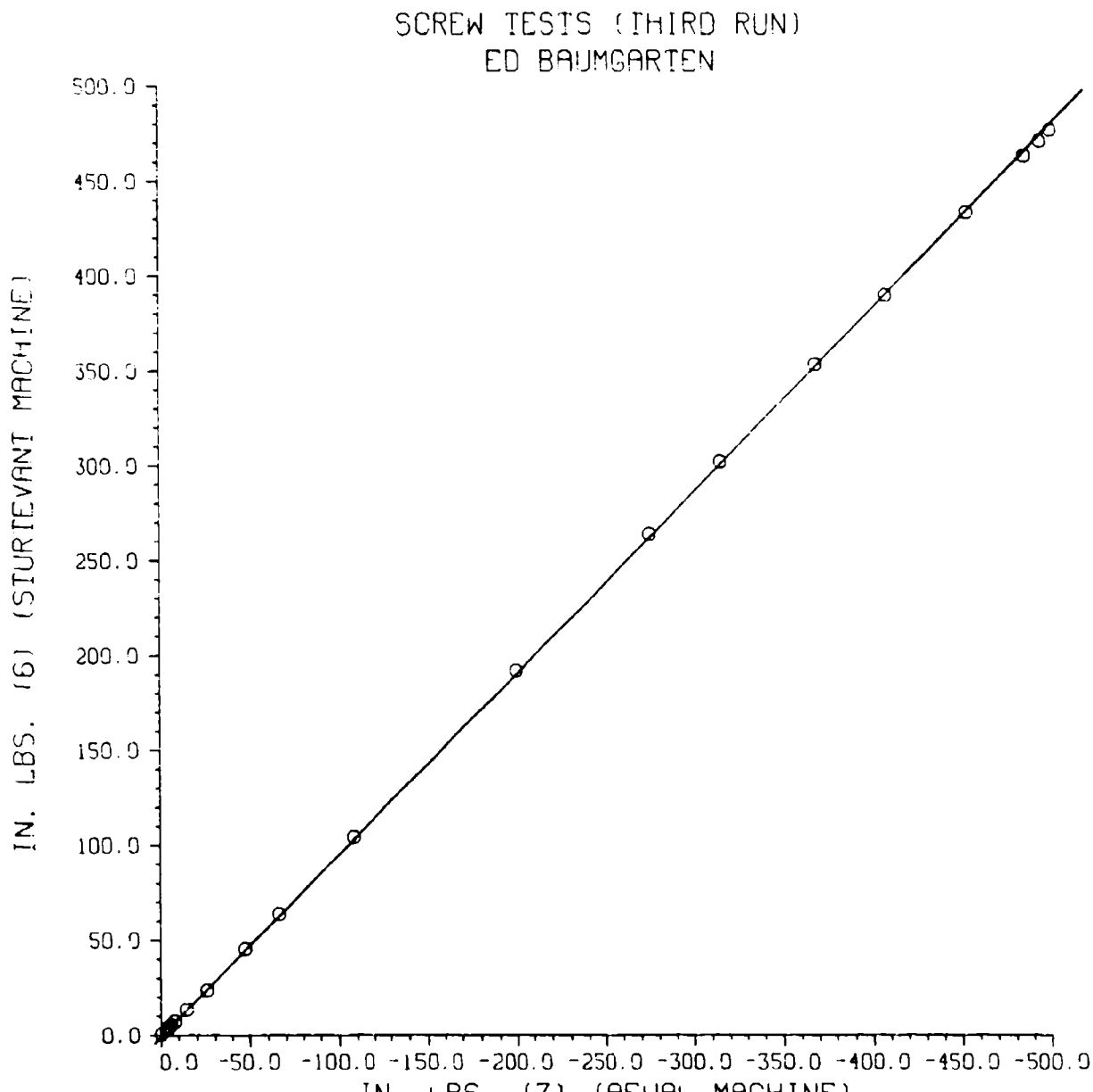


Figure 7. Third Run Calibration Check

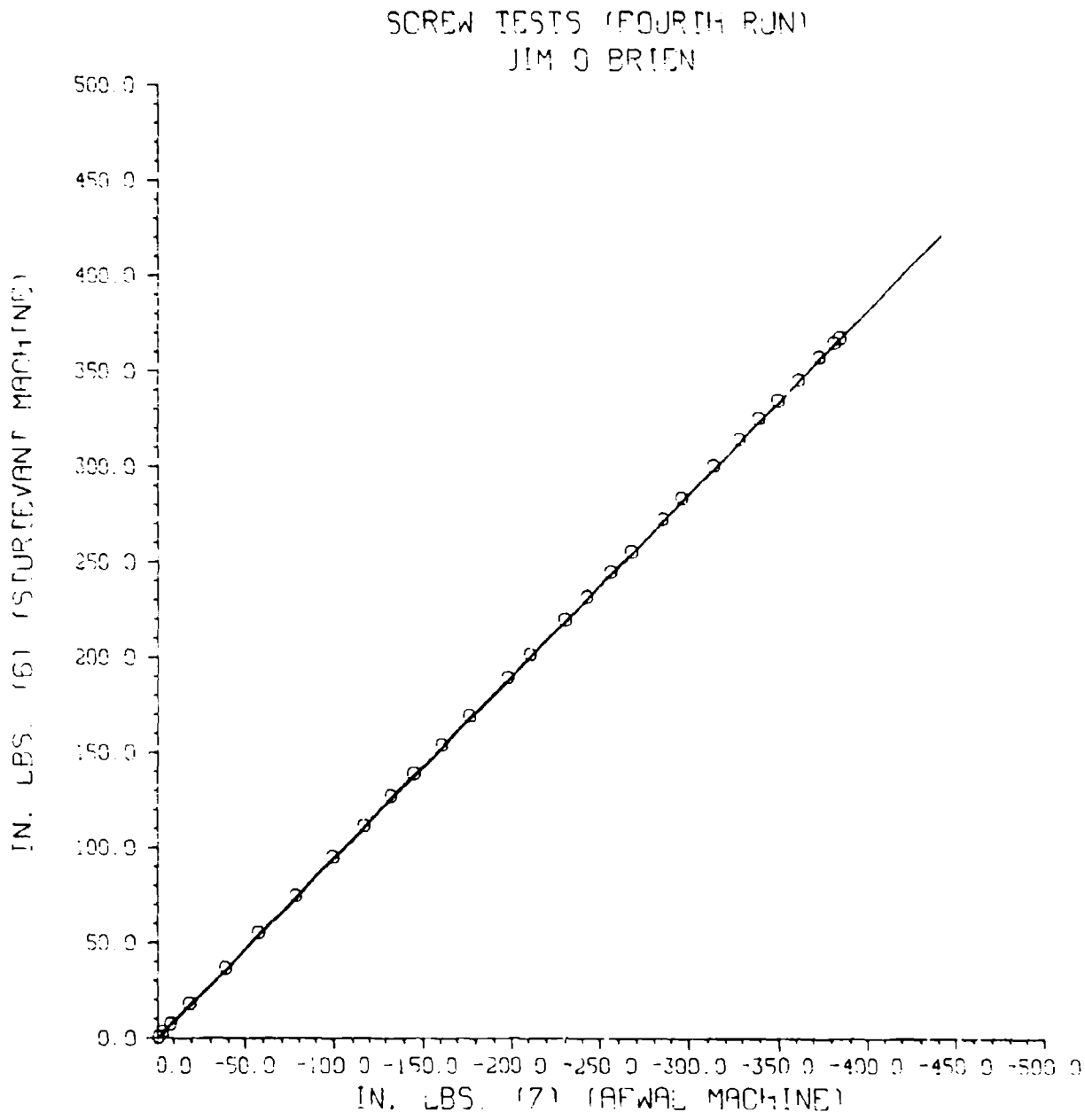


Figure 8. Fourth Run Calibration Check

SECTION IV

TEST APPROACH/PROCEDURES

As indicated in previous investigations, the Aeronautical Systems Division pioneered the development of "damage tolerance" recess testing. This procedure is basically a method to conduct in the laboratory a realistic test of conditions which exist in the field. Damage tolerance is the capability of the recess/ bit combination to transmit torque after some degree of damage. The test procedure is well documented in MIL-STD-1761 (USAF). The testing concept is to achieve a "camout" failure where the driver bit rides up and out of the recess, a new bit is installed and the torque is applied to failure a second time. The amount of torque obtained in this second effort is viewed to be critical with regards to field performance of the wrenching system.

It is expected that once a failure has occurred, the remaining capability of the recess/bit combination would be less than when new. f the second torque value to failure is less than that required for removal, the mechanic would not be able to remove the fastener. The delta torque between the first and second torque values to failure is a measure of the "Damage Tolerance" of the recess design. For a relatively small delta, one would conclude that the recess performance was one that degraded slowly. This design feature is highly desirable since it allows the best chance of removal of the fastener even though it had incurred some recess damage during the first removal attempt. A recess design that offers a significant torque capability to second failure would be of greater practical utility because fastener removal would be more likely.

The specific test procedures were as follows:

1. Load the fastener into the blocks and secure
2. Install proper driver bit into appropriate adapter
3. Mate the driver bit with the recess
4. Introduce angular offset when required
5. Apply appropriate dead weight to simulate the end load
6. Apply torque wrench
7. Take calibration reading before each set
8. Apply smooth torque in the counterclockwise (removal) direction until ultimate failure. Failure is defined as camout, bit breakage, complete load loss or any combination of these failure modes.
9. Remove driver bit and any bit particles which may be in the recess
10. Install a new driver bit into adapter
11. Repeat steps 3 through 9

End Loads

The end loads used in this test program were 10, 20, and 40 lbs. These values were arrived at from data previously gathered in extensive field surveys. The 20 lbs end load was the predominant test load since it was the most common end load observed. Where sufficient test specimens were available, tests were also conducted at 10 and 40 lbs.

Driver Offset

Two offset angles were used, 0^{o} and 4^{o}. The 4^{o} offset from the perpendicular was also determined from previous field surveys to be an average offset angle. Again, the predominant number of tests were conducted at 0^{o}, with 4^{o} offset where sufficient specimens were available.

Driver/Bit Test Combinations

Five separate driver/bit combinations were tested:

(1) Standard Torq-Set driver bit and a standard Torq-Set recess fastener (STD-STD)

(2) Ribbed Torq-Set driver bit and a ribbed Torq-Set recess fastener (RIB-RIB)

(3) Standard Torq-Set driver bit and a ribbed Torq-Set recess fastener (STD-RIB)

(4) Ribbed Torq-Set driver bit and a standard Torq-Set recess fastener (RIB-STD)

(5) Torx driver bit with modified Torx recess fastener

The standard Torq-Set driver bit/standard Torq-Set recess fastener combination was included as the base line since it is widely used on military aircraft. The ribbed Torq-Set driver bit/ribbed Torq-Set recess fastener combination was included since it is purported to be the most effective combination. The standard Torq-Set driver bit/ribbed Torq-Set recess fastener and the ribbed Torq-Set driver bit/standard Torq-Set recess fastener combinations were included for two reasons. First, to isolate any changes in torque capability to either the ribbed Torq-Set driver bit or the ribbed Torq-Set recess fastener. Second, to represent a transitional situation wherein the ribbed Torq-Set driver bit may be used in the field in conjunction with the standard Torq-Set recess fastener, or the standard Torq-Set driver bit in conjunction with the ribbed Torq-Set recess fastener.

Torque Efforts

As explained above, for each fastener specimen two torque efforts per MIL-STD-1761 were applied using a new driver bit for each application.

Test Fasteners

The fasteners tested were of two diameters, 0.190 (#10) and 0.250 inch. These represent the majority of removable screws used on aircraft, and the most easily over-torqued fasteners.

Since this was an expedited test program, production Torq-Set fasteners were obtained from numerous sources such as Grumman Aircraft Corporation, General Dynamics, Fort Worth Division, Air Industries Corporation, and The Phillips Screw Company. Some standard Torq-Set fasteners were also obtained from Base Supply at Wright-Patterson Air Force Base, Ohio. The modified Torx recess fasteners and necessary driver bits were supplied by Air Industries Corporation. The number of Torx fasteners tested was limited by the few driver bits supplied by Air Industries Corporation. Additional Torx driver bits were obtained from Apex Machine and Tool Company.

For most test conditions, at least five separate identical fasteners from the same lot were used for each first and second torque effort totalling 10 tests for each test set. Eighteen separate lots of Torq-Set fasteners and two lots of Torx fasteners were tested. A summary of the test specimens is included in the Appendix.

Driver Bits

Three lots of .190 inch diameter driver bits and two lots of .250 inch diameter driver bits for the Torq-Set fasteners were used. A very limited number of modified Torx driver bits were available which therefore limited the number of Torx fasteners tested. A summary of the driver bits used in the test program is included in the Appendix.

Gaging and Inspection

All the Torq-Set fastener lots were randomly sampled in accordance with

MIL-STD-105D, inspection level S-2, Acceptable Quality Level (AQL) of 2.5, and the recesses inspected. The gages consisted of depth penetration dial gages and go/no-go plug gages to measure the recesses wall angles and "wing" width. The gages used are shown in Figure 9. The inspection criteria of MS33781 and MS14191 were applied to the standard Torq-Set and ACR Torq-Set fastener recesses, respectively. Recess gages and inspection criteria for the modified Torx recess fasteners were not available.

Gages to measure the driver bits blade wear and deflection were not available to determine whether or not the driver bits' critical dimensions remained within specification limits. Therefore, a new driver bit was used to each torque application.

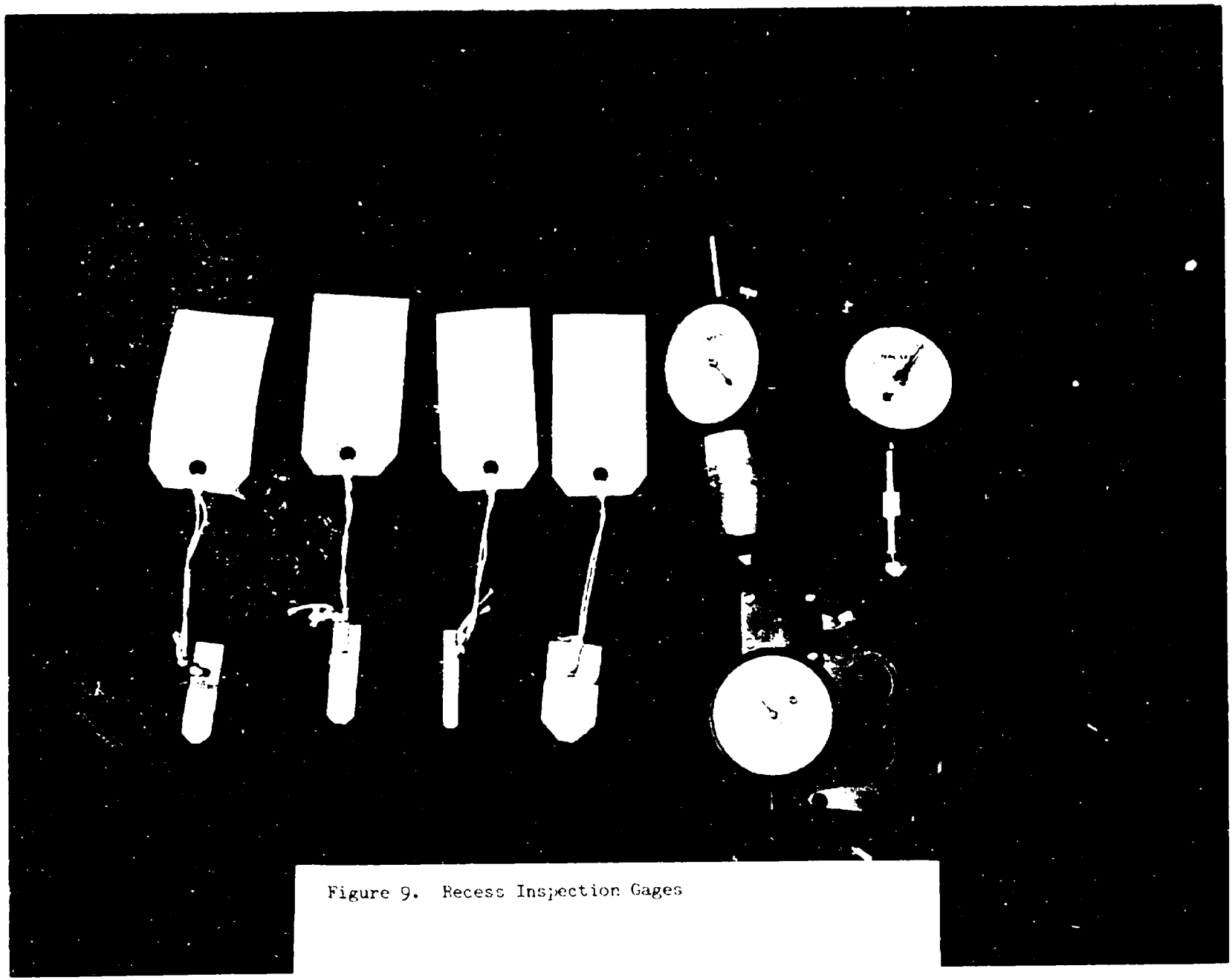


Figure 9. Recess Inspection Gages

SECTION V

TEST RESULTS

The summary of the raw test data is tabulated in Table A-1 in the Appendix. This data is grouped in sets of ten tests corresponding to two torque applications for each of five replicates. The summary identifies the fastener size, driver bit/recess combination, end load, driver/recess offset angle, highest torque attained, condition at highest torque, lot identity, fastener material, and test machine used. For each group of ten tests, the minimum, maximum, and average torque sustained are summarized for both first and second efforts. The test results are presented in bar chart format for the five driver bit/recess fastener combinations tested. All data comparison is referenced to the standard Torq-Set driver bit/standard Torq-Set recess fastener combination since it is widely used in military aircraft applications.

Figure 10 shows the maximum, minimum, and average torque values for the first and second torque applications at 20 lbs end load for the .190 inch diameter fasteners.

Figure 11 presents the same data except for the .250 inch diameter fasteners.

Figures 12 and 13 are the summaries of the average of the first and second application torque values for the .190 and .250 inch diameter fasteners respectively with 20 lbs end load.

Figure 14 depicts the test results with reduced number of test specimens at 4° driver offset.

Figure 15 is the summary of the maximum, minimum, and average torque values for the first and second torque applications at 10 lbs end load for

the .190 inch diameter fasteners.

Likewise, Figure 16 shows the comparable data at 40 lbs end load.

Figures 17 and 18 depict the data of the average torque values for first and second torque applications respectively, regardless of the applied test end loads for the .190 inch diameter standard Torq-Set driver bit/standard Torq-Set recess fastener combination.

Figures 19 and 20 present the comparable data for the ACR Torq-Set driver bit/standard Torq-Set recess fastener combination.

The effects of the base material and/or coating on torque values are shown in Figures 21 and 22. These figures summarize the results for the .190 and .250 inch diameter fasteners respectively, at 20 lbs end load comparing stainless steel and cadmium plated alloy steel fasteners. The standard Torq-Set bit/standard Torq-Set recess fastener combination is compared with the ACR Torq-Set driver bit/standard Torq-Set recess fastener combination.

Figures 23, 24, and 25 show the results of the tests with the limited samples of modified Torx recess fasteners and driver bits.

A summary of the fastener recess and driver bit failure modes is presented in Table 1.

TORQ-SET RECESS TESTS
NUMBER OF TESTS IN EACH CATEGORY AND TOTALS

DIA INS	EFFORT	FAILURE MODE	------BIT-RECESS COMBINATION------ STD-STD	RIB-RIB	STD-RIB	RIB-STD	TOTALS
.190	1	CO	113	26	40	75	254
.190	1	BB	2	19	0	50	71
.190	2	CO	114	36	40	94	284
.190	2	BB	1	7	0	26	34
.250	1	CO	55	3	10	22	100
.250	1	BB	0	5	0	13	18
.250	2	CO	55	7	10	41	113
.250	2	BB	0	1	0	3	4
					TOTAL		878

STD-STD = STANDARD BIT - STANDARD RECESS
RIB-RIB = ACR BIT - ACR RECESS
STD-RIB = STANDARD BIT - ACR RECESS
RIB-STD = ACR BIT - STANDARD RECESS
FAILURE MODE: CO = CAM OUT - BB = BROKEN BIT

TESTS RUN IN JUNE-AUGUST 1981

TABLE 1. SUMMARY OF FAILURE MODES

SECTION VI

DISCUSSION OF TEST DATA

General

The torque capabilities of fasteners are influenced to a great extent by the interface and interaction of driver bit and fastener recess. The performance of any recess can materially be affected by wear, paint, shallow penetration, driver bit deflection, blade corner wear and incorrect blade angle. Coupled with the critical physical parameters, the quality control of the fasteners also has a significant effect upon the torque capability of the recess. Two of the most significant parameters which reflect upon the quality of the fasteners are the blade or wing width and penetration. The penetration depth varies from lot to lot and is attributed to header tool wear. Furthermore, most screw manufacturers do not produce fasteners with maximum recess depth in order to avoid critical screw failures. Therefore, fasteners with recesses within the median tolerance range depth penetration are far more prevalent than fasteners with maximum depth recess penetration. No specific correlation was made between recess depth and performance. Contributing to the degradation of the quality of the recesses is the wear of the punch or header tooling beyond limits, resulting in shallower recesses. The random inspection of ACR Torq-Set fastener lots indicated that the fastener recess conformed to the criteria of MS14191. The random inspection of the standard Torq-Set fastener lots however revealed that not all the fasteners in several lots conformed to the criteria of MS33781. However, in spite of the fact that under a stringent quality control program these lots would have been rejected, these fasteners were none-the-less used in the test program since they were "off-the-shelf" fasteners and represen-

tative of the hardware used in the field. The majority of the testing was performed on .190 inch diameter fasteners at an applied end load of 20 lbs at 0° driver offset. Fewer tests were performed at other end loads and driver offset angles; comparable number of tests were not conducted on the .250 inch diameter fasteners due to the disparity in available test specimens.

The wide scatter of data between the maximum torque attained on the first torque application and the minimum torque attained on the second torque application is attributed to driver/recess interface fit and was aggravated by substandard quality recesses found in the lots of Government inventory off-the-shelf fasteners used in the evaluation. The recess minimum torque requirements listed in Table III of MIL-B-87114A, "Bolts, Recess Drive, General Specification for" formed the basis of comparison for the observed torque values. The reference data is shown in Figures 10 through 25.

Data Analysis

Figure 10 shows that for the .190 inch diameter fasteners the performance of the rib-rib and the rib-std combinations exceeded the base line std-std at 0° driver bit offset and 20 lb end load combination. The torque band between the minimum and maximum torque values was narrow, resulting in an average torque value higher than the std-std combination. Even though the torque band between minimum and maximum torque on the second effort was greater when compared to the std-std combination, the average torque capability on the second effort exceeds the comparable value for the std-std combination. For the rib-std combination, the torque band between minimum and maximum torque on the first effort exceeded the same band for the std-std

combination although the average torque on the first effort exceed the comparable average for the std-std combination. On the second effort, the average torque for the rib-std combination is slightly higher than the std-std combination but lower than the rib-rib combination. As can be seen from Figure 10, the performance of the std-rib combination is comparable to the std-std combination but poorer than either the rib-rib or rib-std combinations.

Figure 11 represents the same trend for the .250 inch diameter fasteners as did Figure 10 for the .190 inch diameter fasteners under the same conditions. The rib-rib combination showed an improvement in the average torque capability for both first and second effort when compared to the std-std combination. In both combinations, the torque band between minimum and maximum values was considerably wider for the second effort than first effort. For the rib-std, the torque band between the minimum and maximum torque values for the first effort was of higher magnitude than the rib-rib combination. The torque band was even wider for the second effort but the average value exceeded the std-std combination but was less than the rib-rib combination. The performance of the std-rib combination exceeded the performance of the std-std combination.

Figures 12 and 13 indicate that for 0° driver bit offset and 20 lbs end load the combined first and second efforts average torque values for the rib-rib, rib-std, and std-rib combinations exceed the combined first and second effort average torque capabilities of the std-std combination. The trend of the data is consistent for both the .190 and .250 inch diameter fasteners; the torque capability improvement in descending order is rib-rib, rib-std, std-rib, and std-std combinations.

Figure 14 presents the torque capabilities for the .190 inch diameter fasteners with driver bit offset of 4° and 20 lbs end load. The first and second effort torque values are essentially comparable with the rib-rib combination showing a slight improvement.

Figure 15 depicts the torque data for the .190 inch diameter fasteners at 0° driver bit offset with an applied end load of 10 lbs. The average first effort torque values were comparable for the four driver bit/recess combinations. The average second effort torque values for the std-std and std-rib combinations were comparable and lower than the first effort average torque values. The average second effort torque values for the rib-rib and rib-std combinations were lower than the other two combinations.

Figure 16 shows the results of the measured torque values for the .190 inch diameter fasteners at 0° driver bit offset and end load of 40 lbs. Due to the limited number of test specimens, only the std-std and rib-std combinations could be compared. The first effort torque values for these combinations were comparable. However, the second effort torque values for the std-std combination exceeded the values for the rib-std combination.

Figures 17, 18, 19, and 20 show the effects of end loads upon removal torque. For the first efforts no significant difference was observed when comparing the std-std combination with the rib-std combination (Figure 17 vs. Figure 19). Likewise, on the second efforts no significant difference was observed when comparing the std-std combination with the rib-std combination except at the 40 lbs end load (Figure 18 vs. Figure 20). The lower removal torque was attributed to the fact that the test specimens came from a lot that failed to meet the recess inspection criteria of MS33781. The depth of the recesses was shallower than required. This condition, coupled

with the recess damage induced during the first effort accounted for the low removal torque at the 40 lbs end load condition. Lack of sufficient fasteners precluded comparable analyses of the effects of end loads for the std-rib and rib-rib combinations.

Figures 21 and 22 depict how the torque values are influenced by the material/coating of the recess. For the .190 inch diameter fasteners and the std-std combination, the first effort average torque values presented in Figure 21 for the cadmium plated alloy steel and A-286 stainless steel fasteners were comparable; however for the second efforts, the torque values for stainless steel fasteners were lower than those for the cadmium plated fasteners which was contrary to expectations. The cadmium plating normally acts as a lubricant between the fastener and driver, caming out at relatively lower torque values. For the rib-std combination, the first effort average torque values were also comparable for both material fasteners. Likewise, the second effort average torque values exhibited the same trend as seen in the std-std combination. Figure 22 shows the comparable materials effects for the .250 inch diameter fasteners. The first effort average torque values for the std-std combination for both materials were comparable with the stainless steel fasteners being slightly higher. The second effort torque values followed the same trend as that exhibited for the .190 fasteners. For the rib-std combination, the first effort average torque values were again comparable. The trend for the second effort average torque values however was reversed from that seen for the std-std combination and the .190 inch diameter fasteners; i.e., the second effort average torque values were higher for the stainless steel fasteners than the cadmium plated fasteners.

Figures 23, 24, and 25 present the test results for the modified Torx fasteners. These fasteners consistently exceeded the MIL-B-87114A reference data torque values for the first efforts for both the .190 and .250 inch diameter fasteners at 20 and 40 lbs end loads, 0° and 4° driver bit offset, using either of two manufacturers driver bits. The second effort average torque values for the .190 inch diameter Torx recess fasteners also met or exceeded this reference datum at 0° driver bit offset for the end loads and driver bits shown in Figure 23.

Failure Mode Analysis

In recess damage tolerance testing, the first failure mechanism observed is recess "tear-out" where the entire recess wall is not only deflected but also suffers a bearing failure. This results in a ramped surface which can extend from the bottom of the recess to the top of the head surface. Because of this ramp, second effort attempts result in catastrophic failures of the recess and/or bit, sometimes with virtually no remaining torque capability. This was evident during this test program where very high first effort torque values were obtained followed by very small torque values during the second effort at the same end loads. The second failure mechanism which was frequently observed with the ACR Torq-Set system, manifested itself in either driver bit breakage or severe permanent torsional deflection of the driver bits. This was attributed to the recess consistently exceeding the rated strength of the driver bits.

Figures 26 and 27 show typical ACR Torq-Set driver bit fracture failures.

Figure 28 shows typical ACR Torq-Set driver bit deflection failures. The top of the head (lower photograph) clearly shows the tearing or smearing

of the removal wall of the recess.

Figure 29 shows a typical .250 inch diameter ACR Torq-Set driver bit failure.

Figure 30 shows a typical modified 5^{0} Torx fastener, driver bit, and recess after testing.

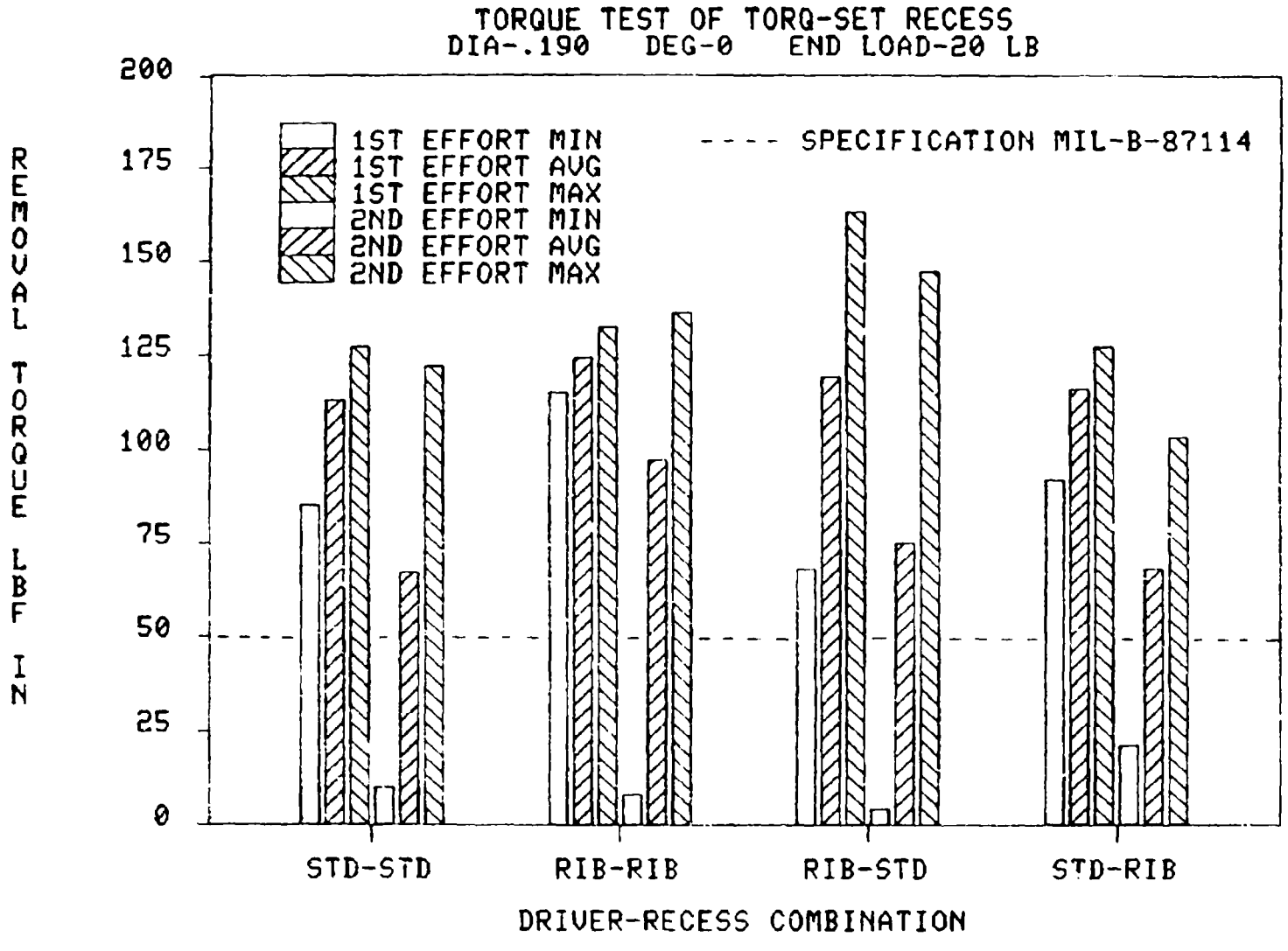


Figure 10. .190 Inch Diameter Torque Test of Torq-Set Recess Drive, Offset 0 Deg and 20 lb end load

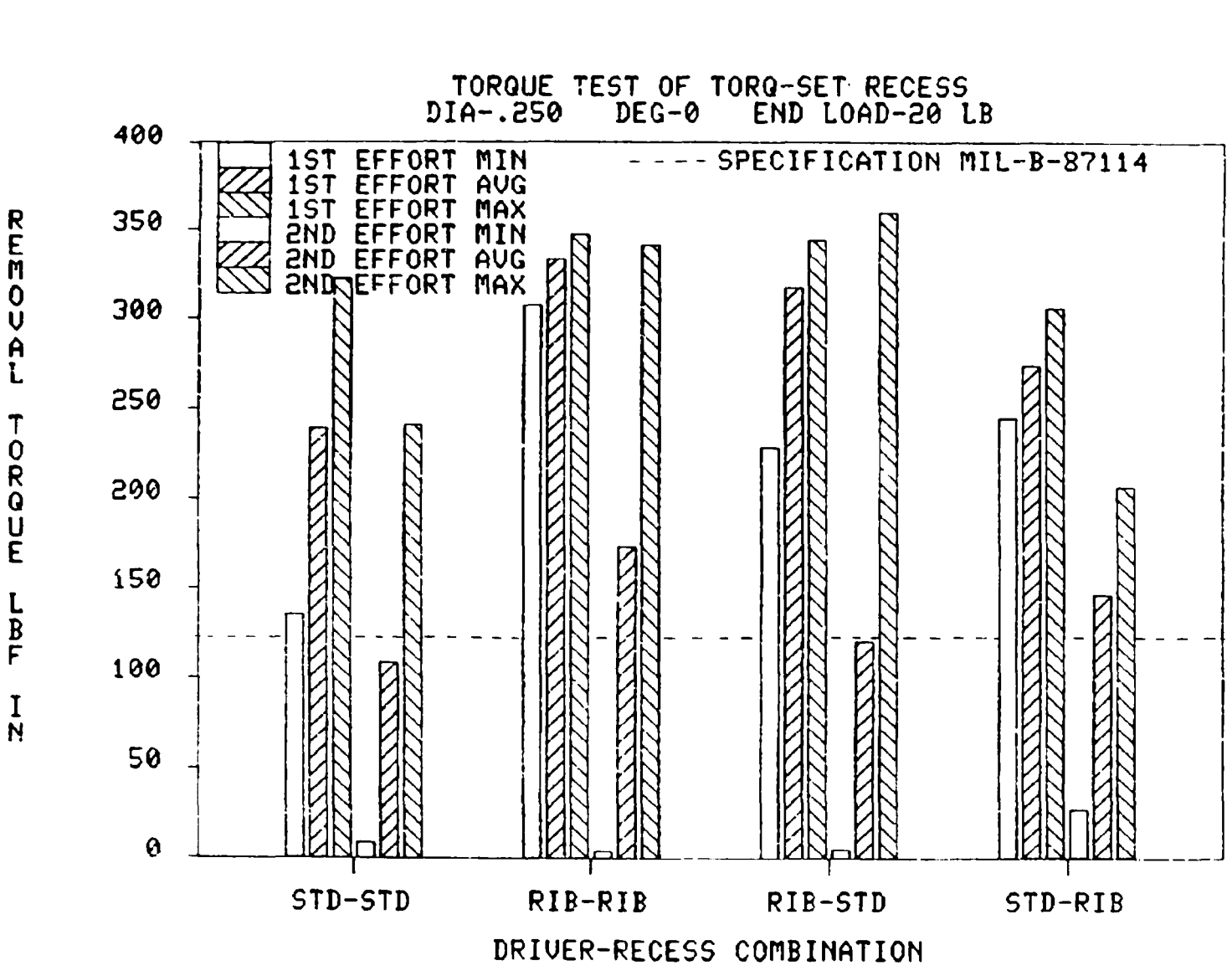


Figure 11. .250 Inch Diameter Torque Test of Torq-Set Recess Drive Offset 0 Deg and 20 lb end load

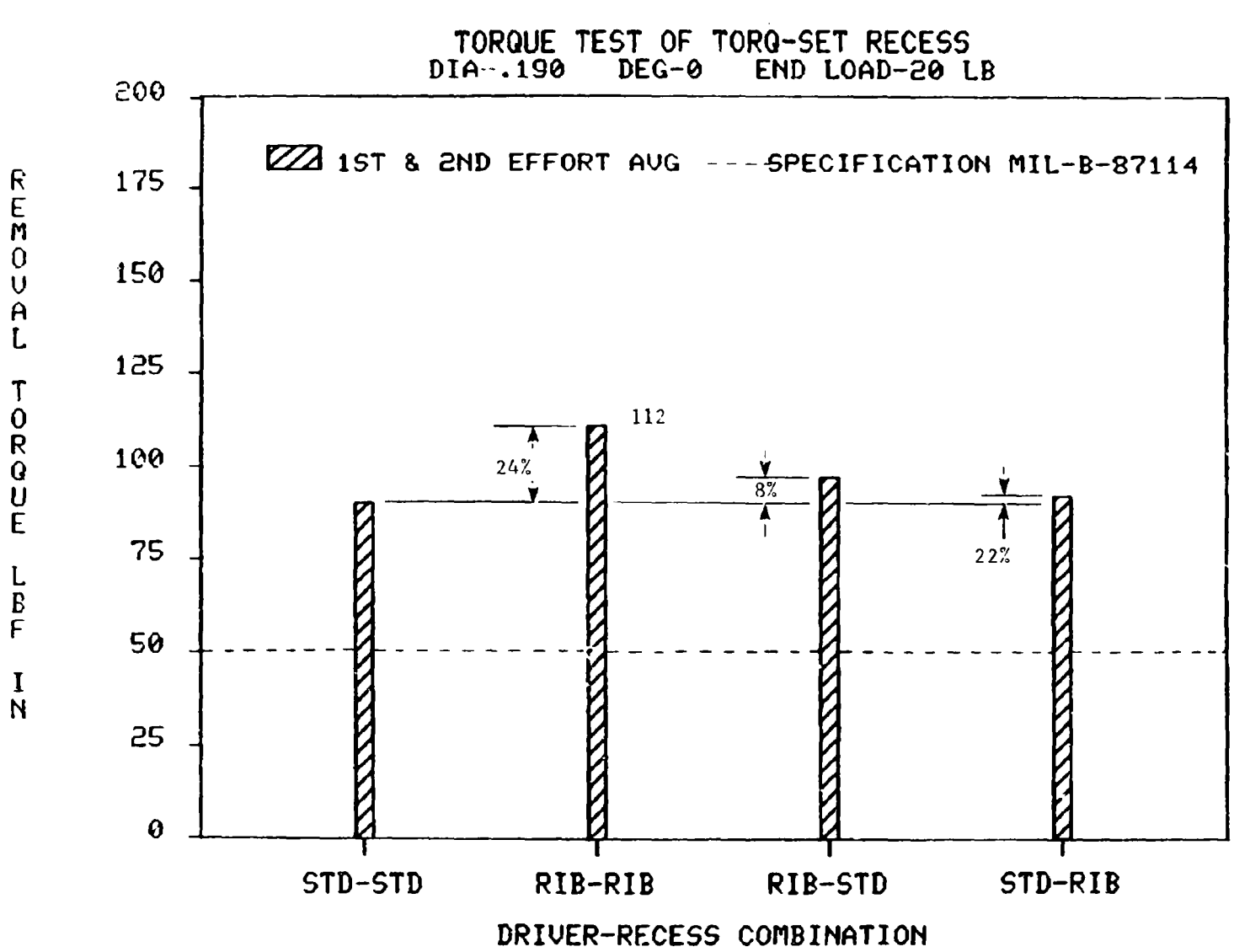


FIGURE 12. AVERAGE FOR FIRST AND SECOND TORQUE EFFORTS FOR .190 INCH DIAMETER

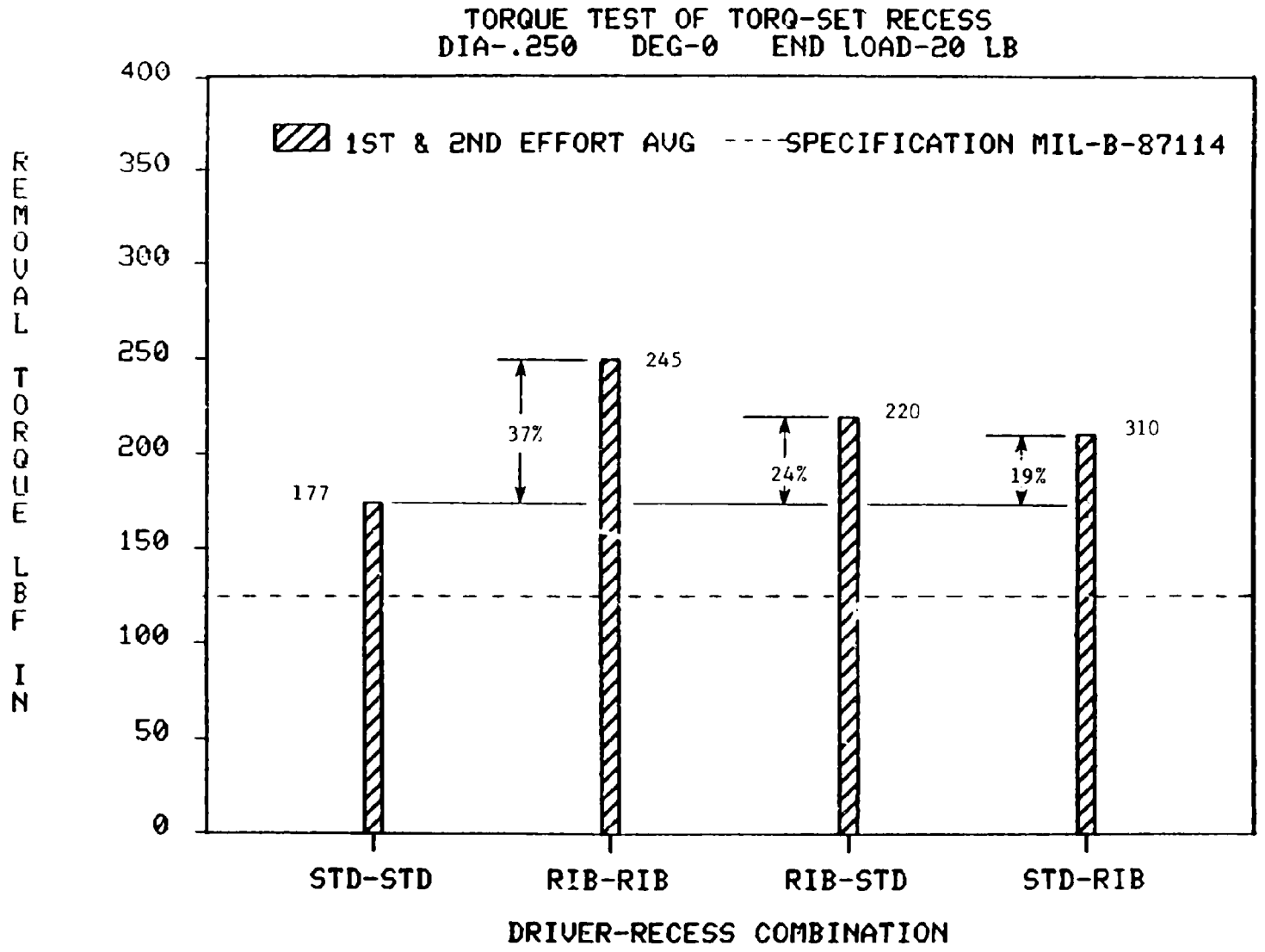


FIGURE 13. AVERAGE OF FIRST AND SECOND TORQUE EFFORT FOR .250 INCH DIAMETER

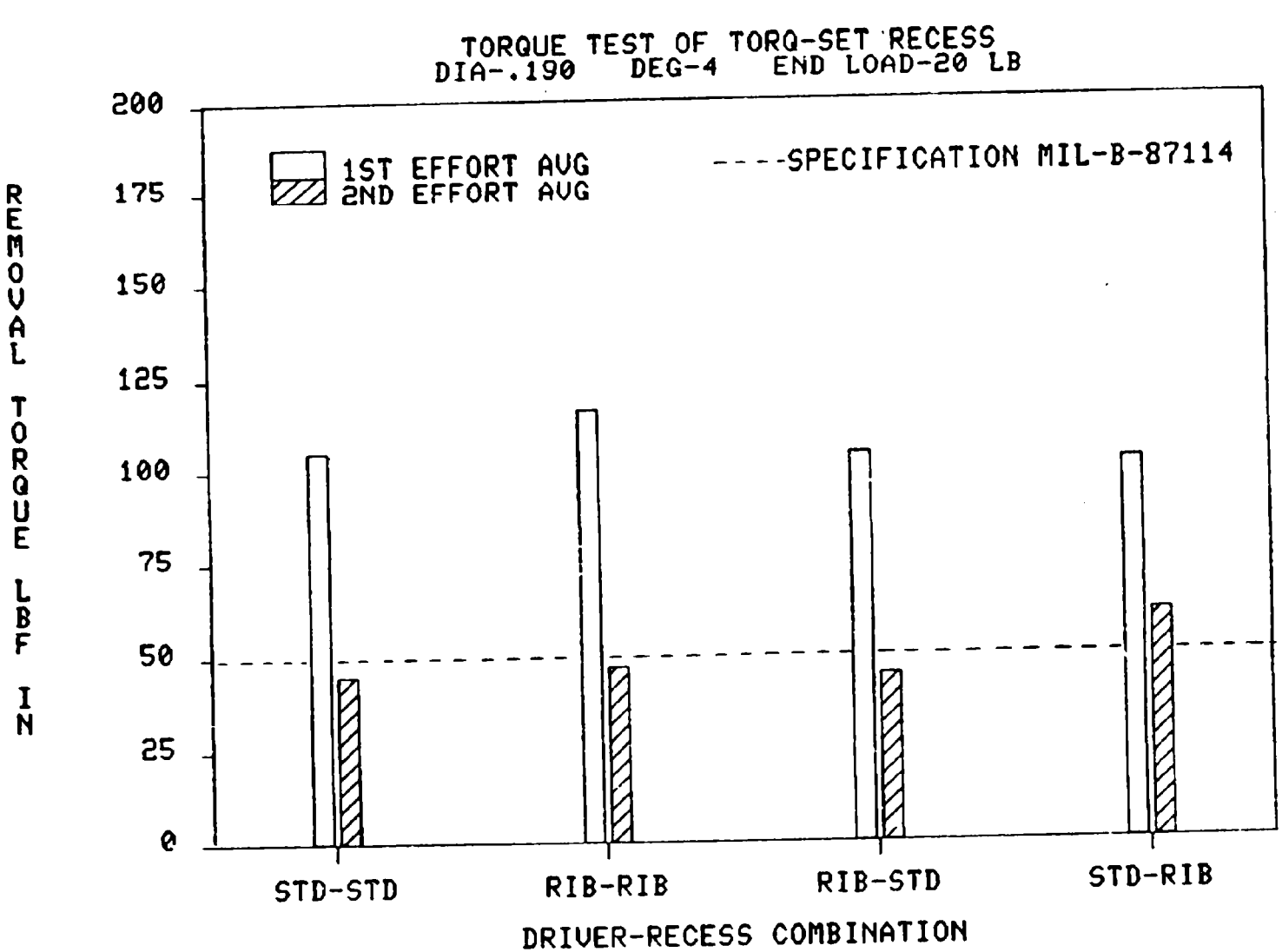


Figure 14. .190 Inch Diameter Torque Test of Torq-Set Recess Drive Offset 4 Deg and 20 lb end load

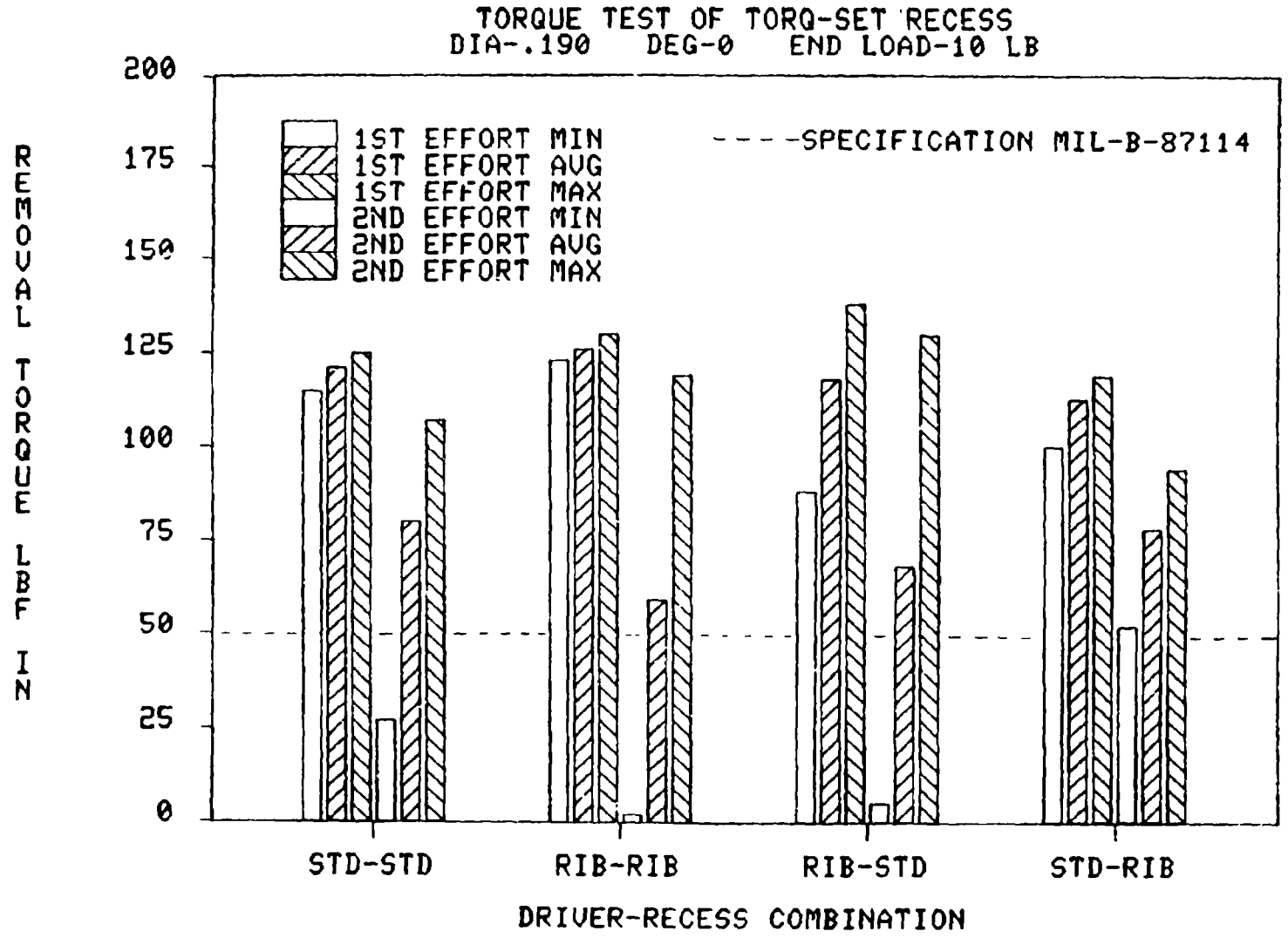


Figure 15. .190 Inch Diameter Torque Test of Torq-Set Recess Drive Offset 0 Deg and 10 lb end load

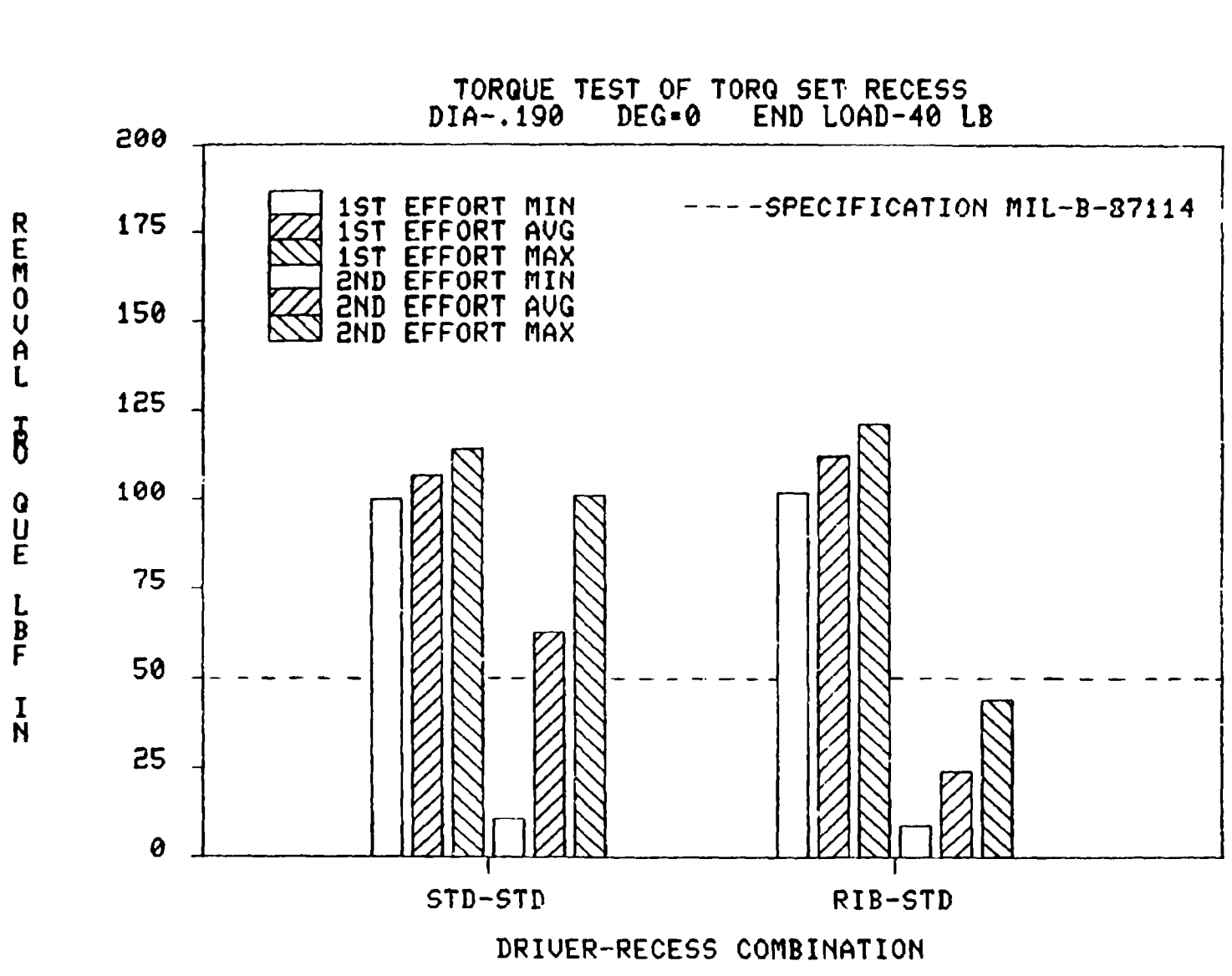


Figure 16. .190 Inch Diameter Torque Test of Torq-Set Recess Drive Offset 0 Deg and 40 lb end load

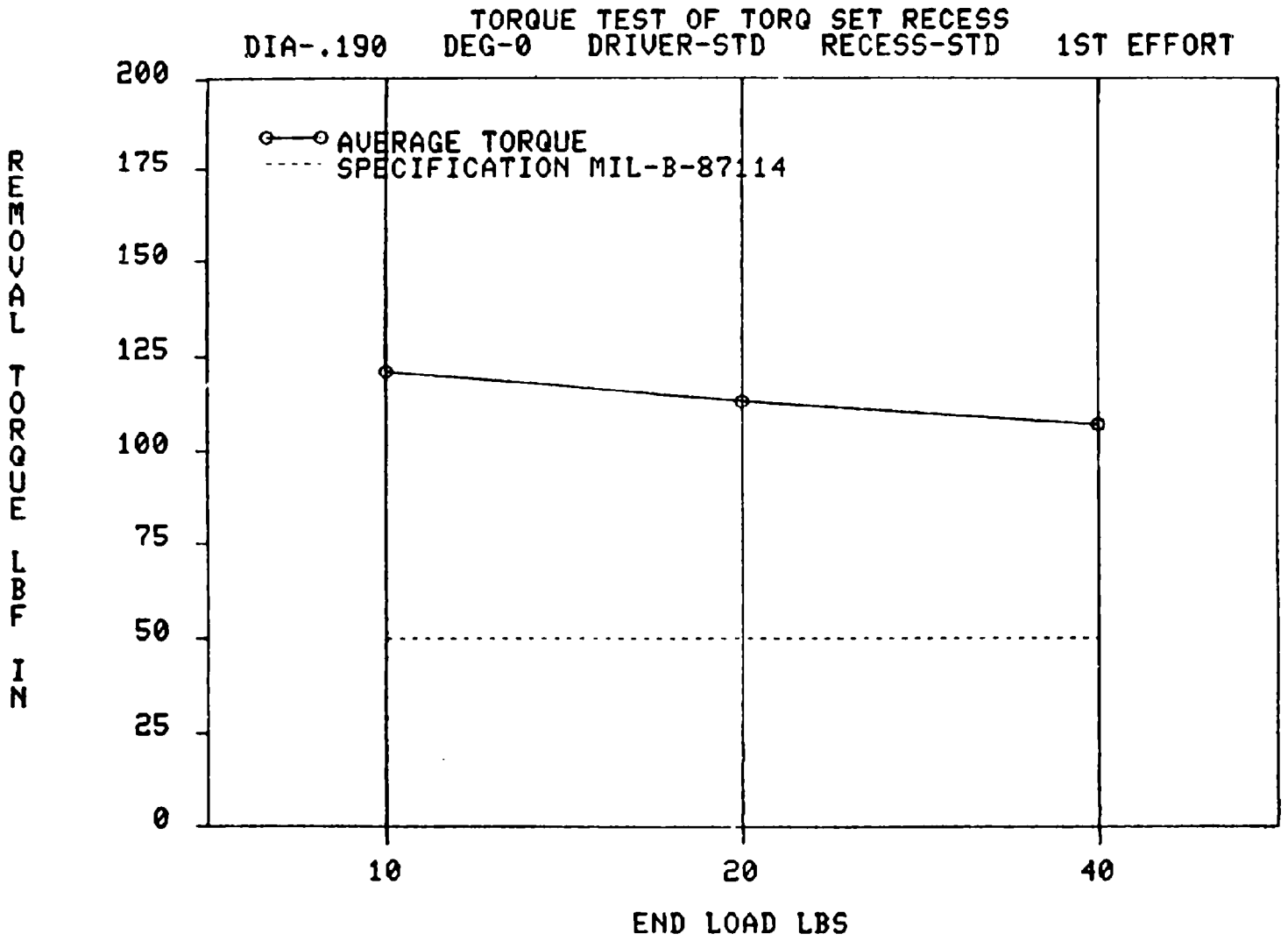


Figure 17. Removal Torque vs End Load Plot of STD/STD Condition .190 Inch Diameter, First Effort

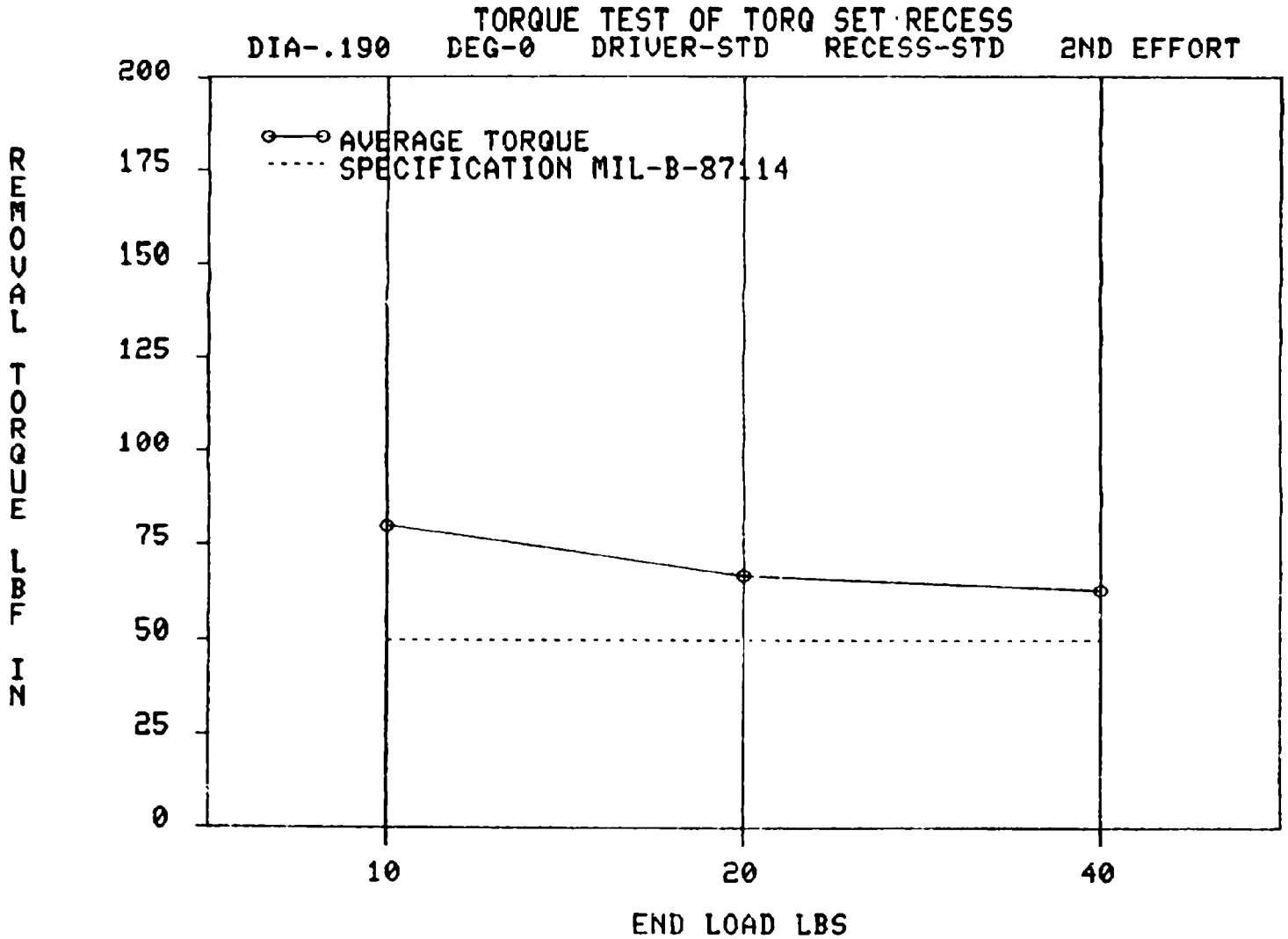


Figure 18. Removal Torque vs End Load Plot of STD/STD Condition .190 Inch Diameter, Second Effort

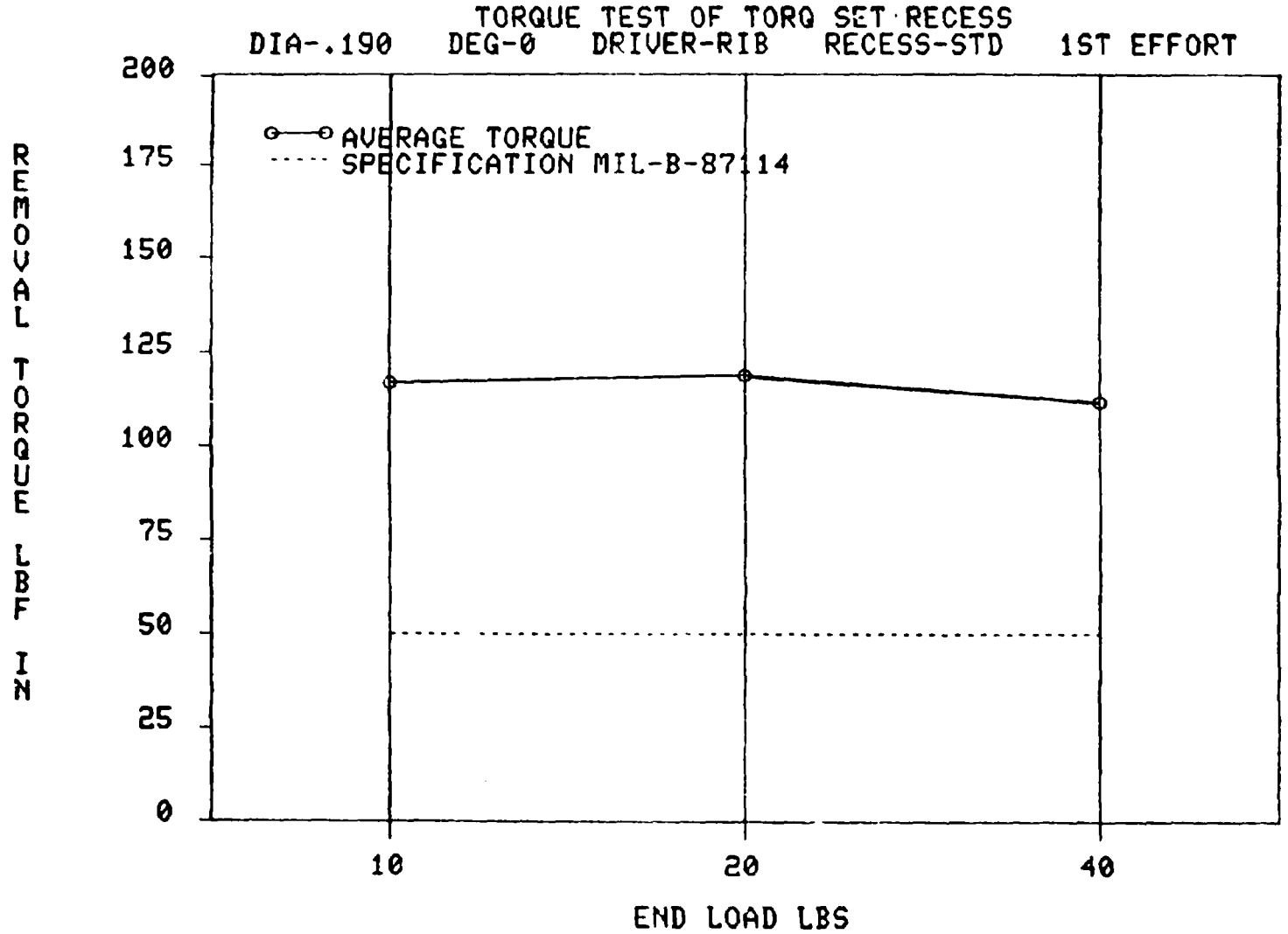


Figure 19. Removal Torque vs End Load Plot of RIB/STD Condition .190 Inch Diameter, First Effort

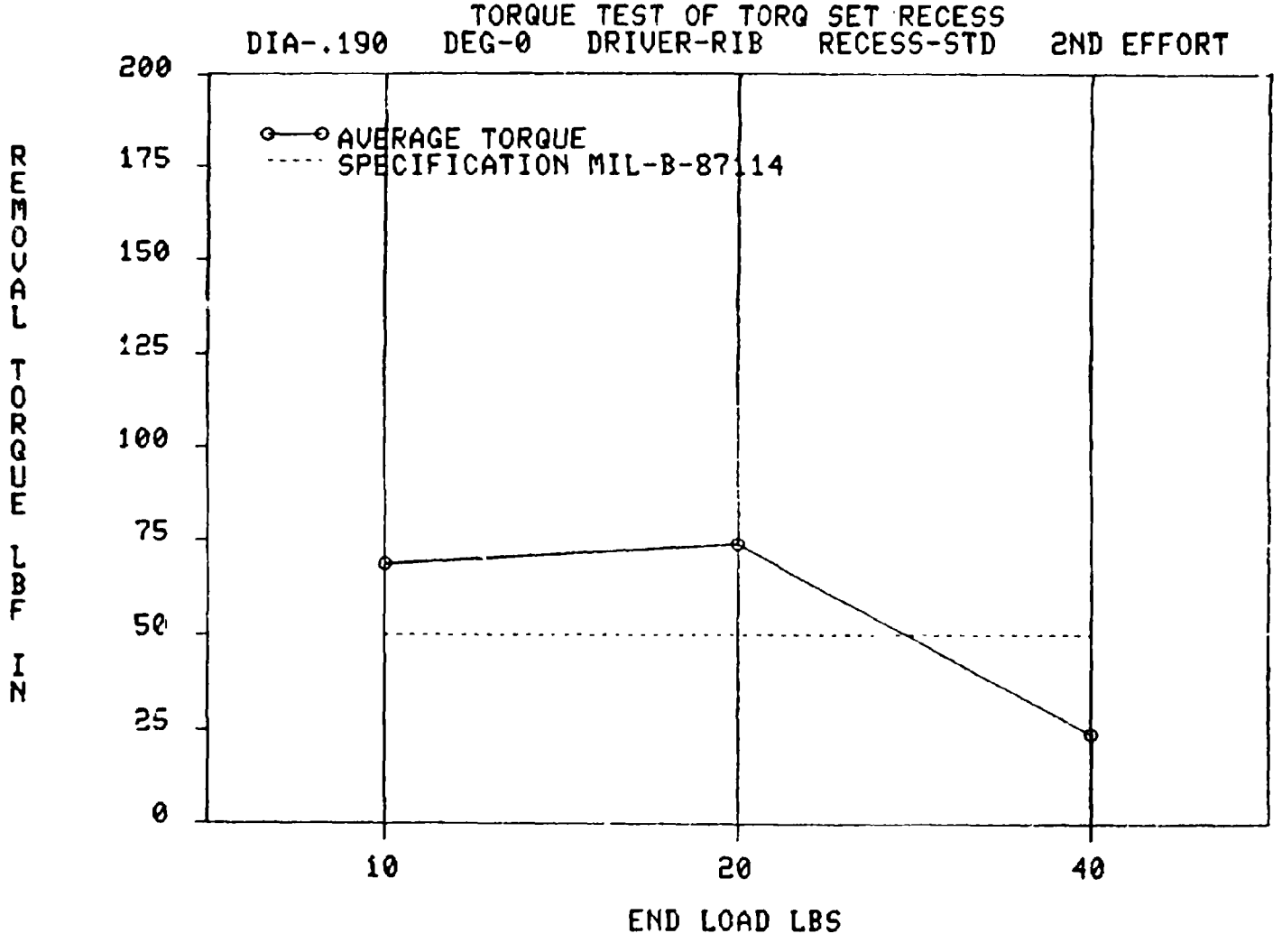


Figure 20. Removal Torque vs End Load Plot of RIB/STD Condition .190 Inch Diameter, Second Effort

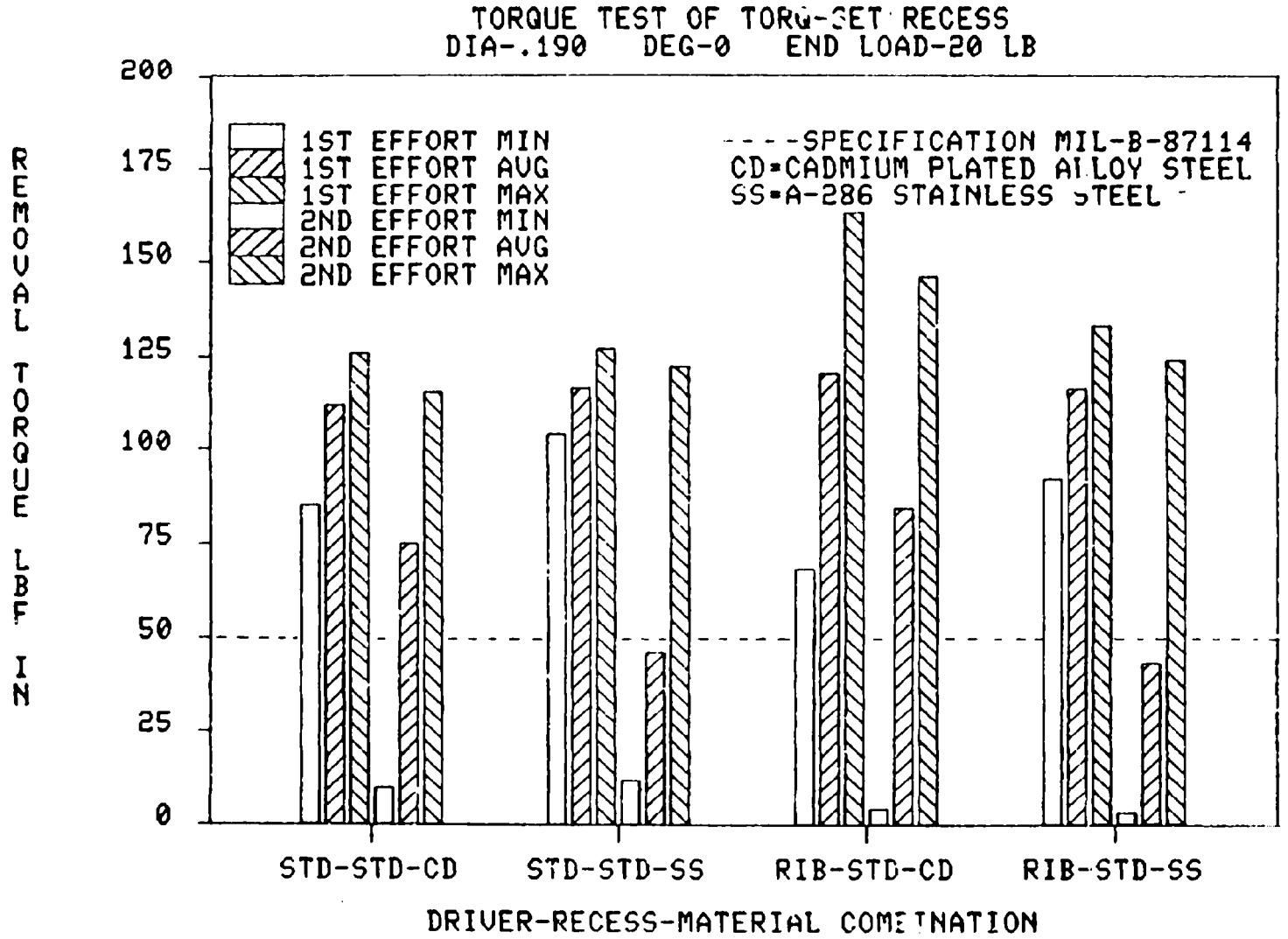


Figure 21. Removal Torque vs Recess Condition & Material Combinations, .190 Inch Diameter

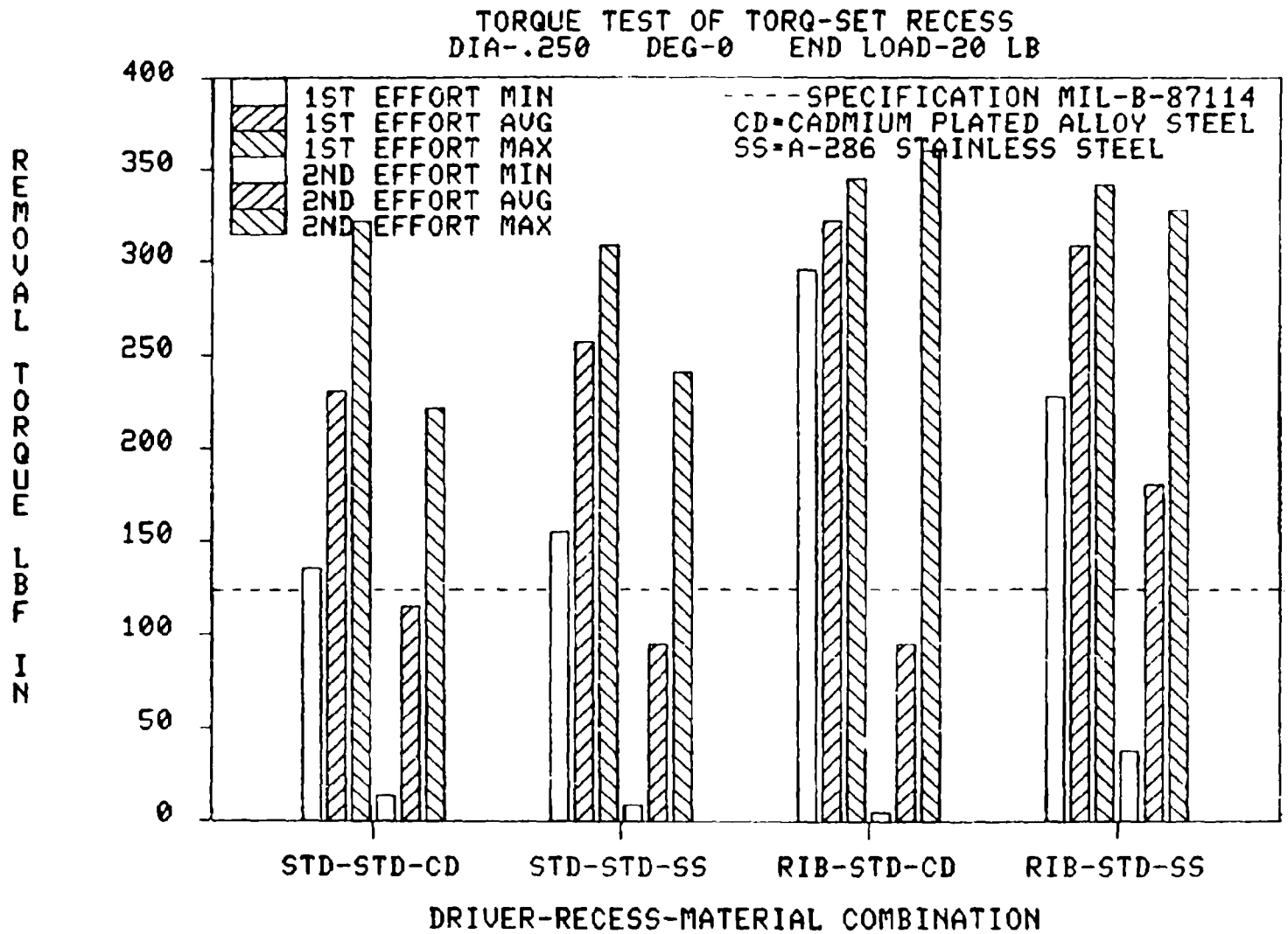


Figure 22. Removal Torque vs Recess Conditions and Material Combinations, .250 inch Diameter

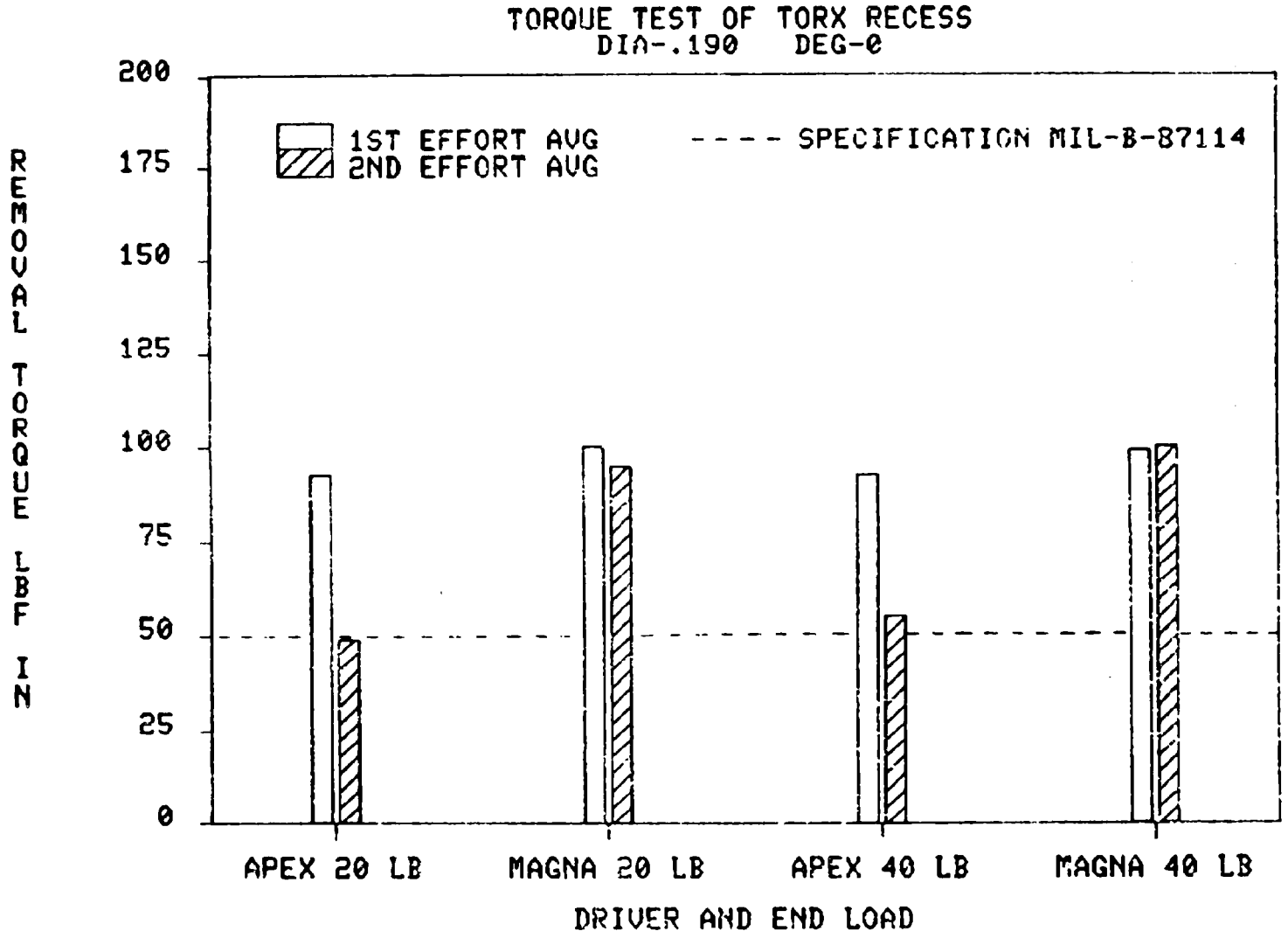


Figure 23. Removal Torque vs End Load for Modified Torx Recess, .190 Inch Diameter

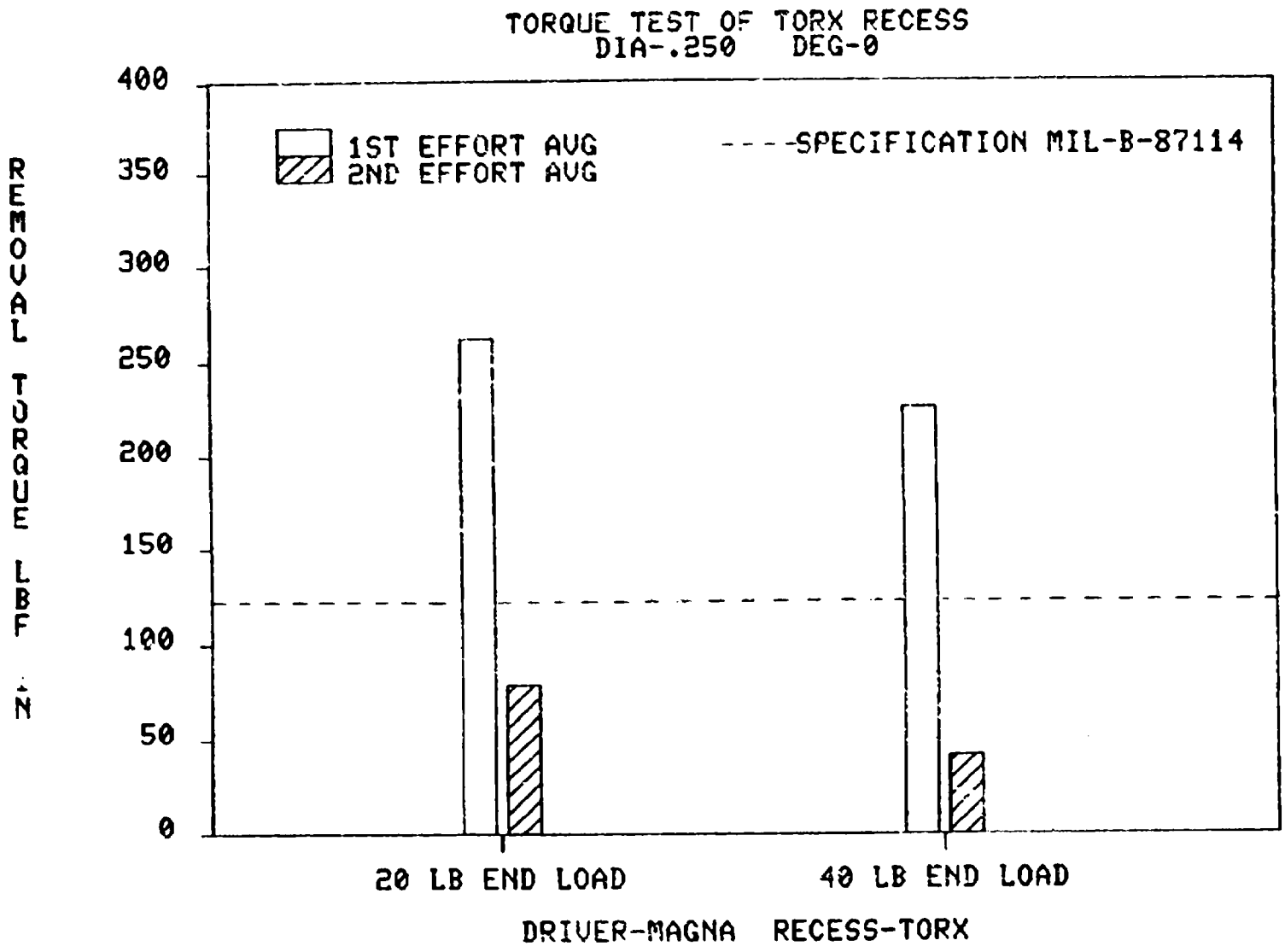


Figure 24. Removal Torque vs End Load for Modified Torx Recess, .250 Inch Diameter

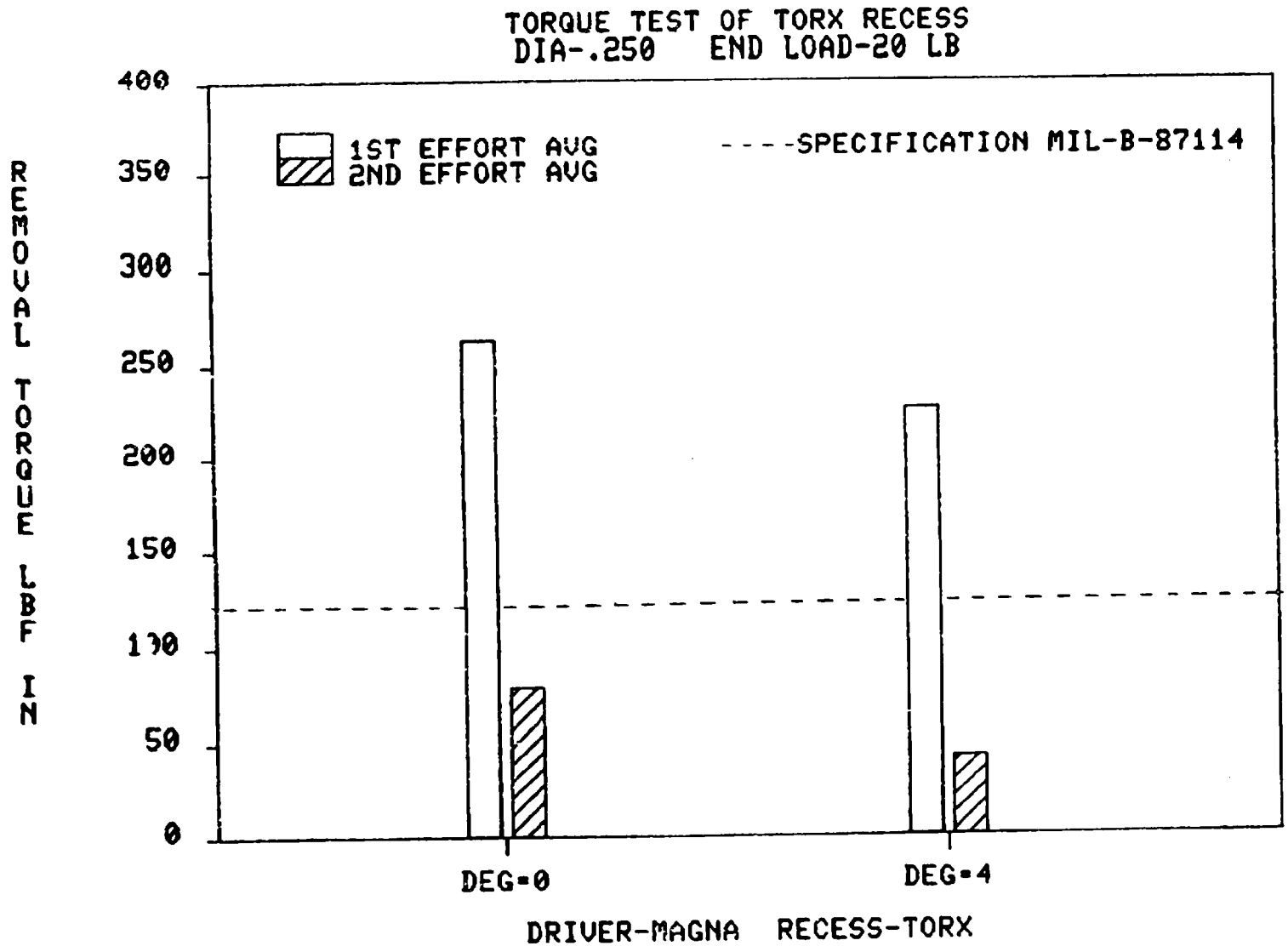


Figure 25: Removal Torque vs Angle of Offset for Modified Torx Recess, .250 Inch Diamecer

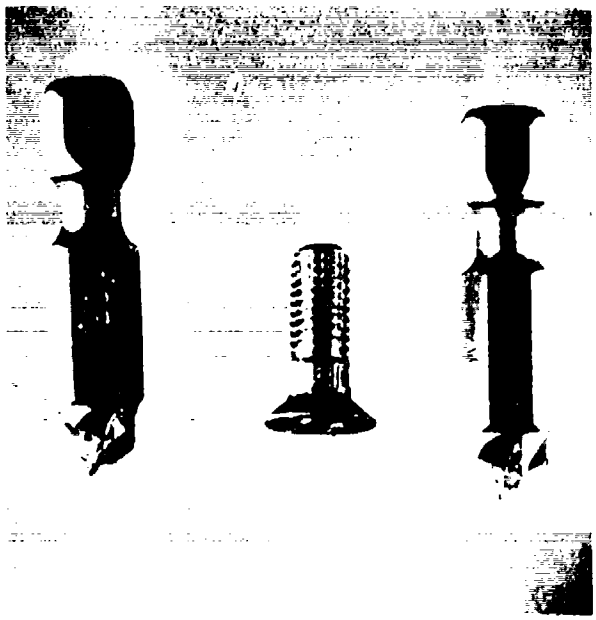


Figure 26. Photograph of Test Specimen Numbers 0103 and 0104

Figure 27. Photograph of Test Specimen Numbers 0105 and 0106

301, 302

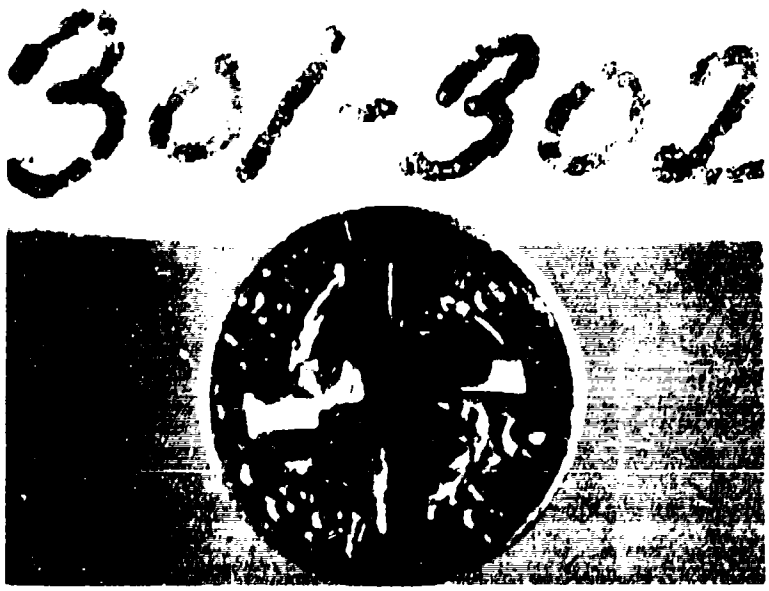


Figure 28. Photographs of Test Specimen Numbers 0301 and 0302

Figure 29. Photograph of Test Specimen Numbers 1407 and 1408

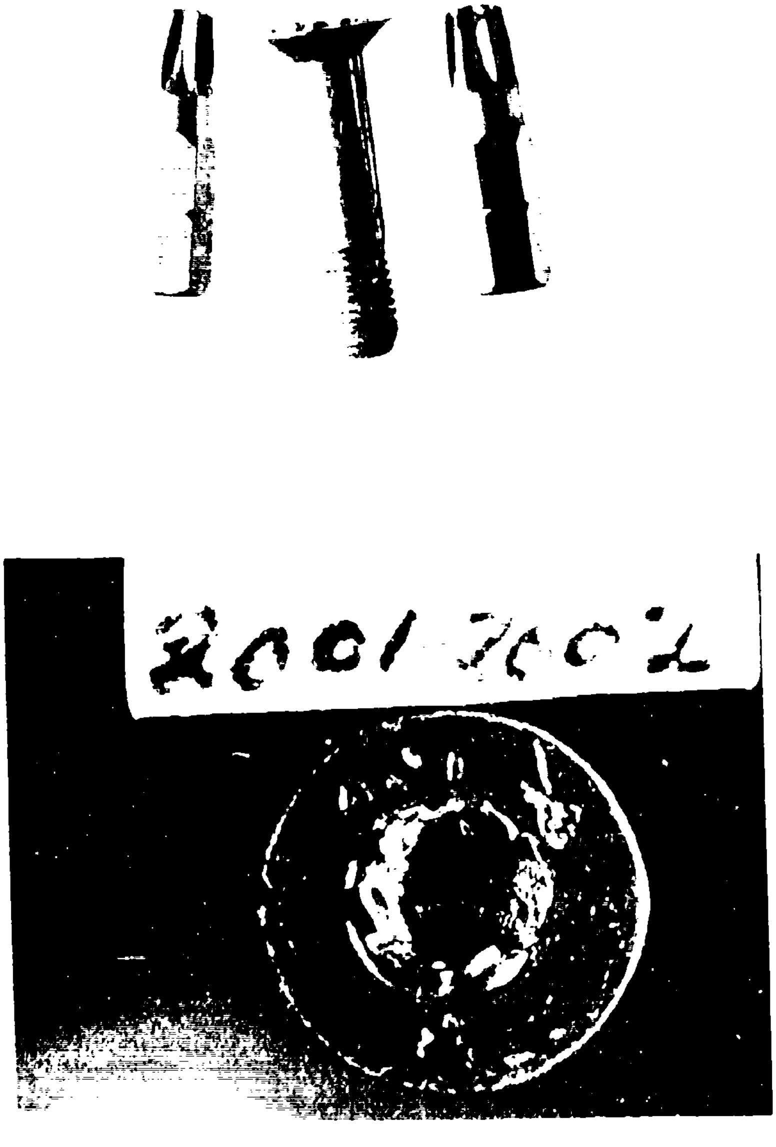


Figure [illegible]. Photographs of Torn Down Test Specimen Numbers [illegible] and [illegible]

SECTION VII

COST ANALYSIS

The most important ingredient for a cost analysis is accurate and adequate input data. At the request of the Aeronautical Systems Division, the Defense Logistics Agency (DLA) through the Defense Industrial Supply Center (DISC) solicited quantity price quotes from licensed and authorized sources of Torq-Set and ACR Torq-Set fasteners. Likewise, the General Services Administration (GSA) solicited cost quotations from licensed and authorized sources of Torq-Set and ACR Torq-Set driver bits. Seven fastener manufacturers responded with price quotations. Six cost quotations were from manufacturers licensed to produce both the standard and ACR Torq-Set recess fasteners. All six manufacturers indicated no difference in price between the fasteners with either recess. The seventh respondent quoted 10% higher price for all sizes/diameters of the ACR Torq-Set recess fasteners than the standard Torq-Set recess fasteners.

Initially only Apex Machine and Tool Company responded with a price quotation for the driver bits, quoting the ACR Torq-Set driver bits costing 80% more than the Torq-Set driver bits. Subsequently, a price quotation from Zephyr Manufacturing Company indicated that the new ACR Torq-Set driver bits would cost approximately 25% more than the Torq-Set driver bits for all sizes. A more recent up-to-date cost quote received from Apex Machine and Tool Company revised their original quote, indicating that the cost of the ACR Torq-Set driver bits is approximately 55% higher than the cost of comparable standard Torq-Set driver bits, reflecting a downward trend. In a competitive atmosphere and for large production quantities the cost advantage of the standard Torq-Set driver bits can be expected to diminish even

further.

Additional cost associated with any new item introduced into the DOD inventory are the one time introduction cost (cataloging and stock number assignment) and annual item management cost (inventory control) estimated at $1200 and $150 respectively, in FY 80 dollars. The source of these costs was AFLCP 173-10 dated 28 August 1980.

Any potential cost increases associated with adopting the ACR fasteners consists of the purchase price differential, if any, between the ACR and standard Torq-Set recess fasteners and driver bits, plus the aforementioned cost associated with the introduction of a new item.

Potential cost reduction associated with adoption of the ACR Torq-Set fasteners results from a decrease in damaged fasteners and the corresponding lower drillout rate of damaged fasteners. The greater removal torque capacity will result in a reduced number of camouts/damaged fasteners/drillouts. Since fastener drillouts have an impact on manpower, aircraft downtime for maintenance, and readiness these factors would be favorably affected by adopting the ACR feature.

The data most closely associated with camout/drillout is accumulated under "How malfunction code" (HMC)-105 in the AFM 66-1 maintenance data collection system. This code encompasses "loose or damaged bolts, nuts, screws, rivets, and fasteners, clamps, or other common hardware." This data was analyzed, but it was found that the category was much too general to gather any useful information concerning fastener drillout rates or manhours associated with fastener drillouts. The lack of this data therefore precludes a quantitative measure to support a potential cost savings from a maintainability standpoint.

SECTION VIII

SERVICE EXPERIENCE

Several major airlines have gained some service experience with the application of the ACR feature in a variety of conical type recess fasteners. In order to draw on their experience a questionnaire was sent to the following airlines, four of which responded:

Pan American World Airways

United Airlines

American Airlines

TWA

Delta Airlines

TWA has standardized on the ACR recess fastener and is using the NAS7000 series screws. They procure both standard and ACR driver bits. TWA has insufficient experience at this time to assess the advantages/disadvantages of the ACR recess fasteners for the service life of their aircraft. They do not monitor the frequency of camouts or drillouts of either the standard or ACR recess fasteners, nor are they able to correlate bit wear/breakage with type of recess although they report less bit wear.

Delta Airlines is using the "Deep 4" Tri-Wing #10-32 100° countersunk bolts with the ACR feature in three lengths on access panels. The No. 4 Tri-Wing driver bits have the ACR feature, but all other bits are standard. A service test conducted by Delta Airlines comparing #10-32 No. 5 standard Tri-Wing recess fasteners to the #10-32 "Deep 4" Tri-Wing ACR recess fasteners showed a marked decrease in camouts with the latter recess. During this service test, no drillouts of ACR fasteners were reported yet the maintenance department continued to report a high drillout rate for the

remaining Tri-Wing fastener system. Delta does not consider driver wear/breakage a problem and has been unable to correlate driver wear/breakage with a particular type of recess. Their ACR fasteners replaced NAS4403-2, -3, and -4 fasteners commonly used for access panels. They have been hampered in their expansion of the use of the ACR Tri-Wing fastener system by the lack of NAS specifications. Delta is presently considering the NAS7100 Phillips system of which some recesses have the ACR feature. Delta does not consider fastener problems a factor in down-time scheduling.

United Airlines does not foresee the need for the ACR fasteners unless the fasteners present an economic advantage. On the basis of their observations to date, United is of the opinion that the ribs would not survive. On the basis of information available to United Airlines from other users, they estimate the non-ACR driver bits to have approximately twice the life.

American Airlines has no current plans to make a significant move towards the Anti-Camout Rib Recess Fastener System. Any commitment to a new fastener system must be preceded by documented successful service experience. American Airlines' principal concern is the ability of the ACR driver bits and their ribs to stand up in service.

SECTION IX

CONCLUSIONS

Based on the results of the test program and the other analyses presented in this report, the following conclusions are presented:

a. The ACR Torq-Set driver bit/ACR Torq-Set recess fastener combination demonstrated generally increased first and second effort removal torque capability when compared to the standard Torq-Set driver bit/standard Torq-Set recess fastener combination.

b. The ACR feature in either the Torq-Set driver bit or Torq-Set fastener recess when used with either the standard Torq-Set fastener recess or standard Torq-Set driver bit respectively, demonstrated comparable or improved removal torque capability when compared to the standard Torq-Set driver bit/ standard Torq-Set recess fastener combination.

c. The driver bits with and without the ACR feature can be used interchangeably with either the standard or ACR Torq-Set recess fasteners.

d. No price differential exists between the standard and ACR Torq-Set recess fasteners. The cost benefits are realized in lower drillout rate of damaged fasteners.

e. The cost of the ACR Torq-Set driver bits is higher than the cost of the standard Torq-Set driver bits. In a competitive atmosphere and for large production quantities, the cost advantage of the standard Torq-Set driver bits can be expected to diminish.

f. The continued coexistence of the Torq-Set recess standard, MS33781, and the ACR Torq-Set recess standard, MS14191, will provide suitable alternatives where the aircraft manufacturer selects the Torq-Set fasteners for his design.

SECTION X

RECOMMENDATIONS

On the basis of the results of this evaluation, the following recommendations are presented:

1. The Department of Defense permit the use of the ACR Torq-Set fastening system as a suitable alternate for the standard Torq-Set fastening system.
2. The cognizant military services maintain the standardization documents, MS14191 and MS33781, for the ACR and standard Torq-Set recesses, respectively.

APPENDIX

Observers of Testing, Lot Identification, Raw Data, and Distribution List

OBSERVERS

Personnel from the following organizations observed and/or participated in some portions of the test program:

ASD/EN	WPAFB OH
ASD/ENO	WPAFB OH
ASD/AFHE	WPAFB OH
ASD/ENF	WPAFB OH
ASD/ENFEM	WPAFB OH
ASD/ENFEF	WPAFB OH
AFWAL/FIBT	WPAFB OH
AFWAL/FIBEC	WPAFB OH
AFWAL/MLSA	WPAFB OH
AFLC/PTEM	WPAFB OH
DISC/ESA	Philadelphia PA
DISC/ELA	Philadelphia PA
Air Industries Corporation	Garden Grove CA
Apex Machine and Tool Company	Dayton OH
Battelle Columbus Laboratories	Columbus OH
Fairchild Republic Corporation	Farmingdale NY
Lockheed-Georgia Company	Marietta GA
Phillips Screw Company	Gloucester MA

SUMMARY OF TEST SPECIMENS

ASD Lot No.	Source	Part #	Recess
1	Litton Fastening Sys.	NAS1580A3T3	ACR
	Lot No. M127699		(Per
	Gage Penetration .063		MS14191)
2	Litton Fastening Sys.	NAS1580A3T5	ACR
	Lot No. M127698		(Per
	Gage Penetration .067		MS14191)
3	P.B. Fastener Corp.	NAS1580A3T8	STD
	Lot No. 78-3042		(per
	Gage Penetration .061		MS33781)
4	Screw Corp. Div of VSI	NAS1580A3T6	STD
	Lot No. 47782		(per
	Gage Penetration .060-.061		MS33781)
5	P.B. Fastener Corp.	NAS517-3-3	STD
	Lot No. G-3850 Heat 09023		(Per
	Gage Penetration .066		MS33781)
6	Mid America Aerospace	NAS1580A3T6	STD
	Lot No. - unknown - parts		(Per
	From Grumman Stores		MS33781)
	Gage Penetration .056-.067		
7	Mid America Aerospace	NAS1580A4T4	ACR
	Lot No. 81-0928		(Per
	Gage Penetration .086-.088		MS14191)

ASD Lot No.	Source	Part #	Recess
8	Mid America Aerospace	NAS1580A4T8	STD
	Lot No. Unknown - Parts		(Per
	From Grumman Stores		MS33781)
	Gage Penetration .078-.088		
9	Litton Fastening Sys.	NAS1154-4	STD
	Lot No. M98252		(Per
	Gage Penetration .084-.086		MS33781)
10	Mid America Aerospace	NAS1153E3	STD
	Lot No. Unknown-Parts		(Per
	From Grumman Stores		MS33781)
	Gage Penetration .061-.066		
11	Parts Identified only	NAS1623-4	STD
	by a "K" Presumably		(Per
	Kenaloy Co. Lot No. Unknown-		MS33781)
	Parts from WPAFB Base Supply		
	Gage Penetration .060-.064		
12	Screw Corp. of VSI	75344A8	STD
	Lot No. Unknown		(Per
	Gage Penetration .054-.074		MS33781)
13	Air Industries Corp.	NAS1581C4T5	STD
	Lot No. Unknown-Parts (A-286)		(Per
	From General Dynamics		MS33781)
	Fort Worth Div.		
	Gage Penetration .062-.066		

ASD Lot No.	Source	Part #	Recess
14	Air Industries Corp. Lot No. Unknown-Parts From General Dynamics, Fort Worth Div. Gage Penetration -.052-.060	NAS1580C3T5 (A-286)	STD (Per MS33781)
15	Air Industries Corp. Lot No. Unknown-Parts From General Dynamics, Fort Worth Div. Gage Penetration .075-.080	NAS1580C417 (A-286)	STD (Per MS33781)
16	Air Industries Corp. Lot No. Unknown-Parts From General Dynamics Fort Worth Div. Gage Penetration, .048-.063	NAS1581A4T5	STD (Per MS33781)
17	Air Industries Corp. Lot No. Unknown-Parts From General Dynamics, Fort Worth Div. Gage Penetration .070-.081	NAS1580A4T6	STD (Per MS33781)
18	Air Industries Corp. Lot No. Unknown-Parts From General Dynamics, Fort Worth Div. Gage Penetration .051-.063	NAS1580A3T5	STD (Per MS33781)

ASD Lot No.	Source	Part #	Recess
19	Air Industries Corp.	413A4-12	Torx
	Lot No. - Unknown		
	Gage Penetration - Not measured		
20	Air Industries Corp.	406A3-9	Torx
	Lot No. - Unknown		
	Gage Penetration - Not measured		

Driver Bits Tested

Size	Configuration	Mfrg. # & Lot Number
No. 10	Standard Torq-Set Bits	Apex 170-10 DA-037-227
No. 10	Standard Torq-Set Bits	Apex 170-10 564659
No. 10	ACR Torq-Set Bits	Apex 170-10 ACR DA-038-768
1/4"	Standard Torq-Set Bits	Apex 170-1/4 DA-037-227
1/4"	ACR Torq-Set Bits	Apex 170-1/4 ACR DA-010-614B
No. 10	Torx 3° Taper	MagnaTX20W Special
No. 10	Torx 3° Taper	ApexTX20W Unknown
1/4	Torx 5° Taper	MagnaTX10W Special
1/4	Torx 5°Taper	ApexTX30W Unknown

TABLE A-1 SUMMARY OF RAW TEST DATA

DATE 01/26/82 PAGE 1

TEST NUMBER	DIAMETER INCHES	BIT-RECESS		END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
101	.1900	RIB	RIB	20.00	0	1	125.00	CO-BD	1	1	6	19810610
102	.1900	RIB	RIB	20.00	0	2	8.00	CO	1	1	6	19810610
103	.1900	RIB	RIB	20.00	0	1	126.00	BB	1	1	6	19810610
104	.1900	RIB	RIB	20.00	0	2	126.00	BB	1	1	6	19810610
105	.1900	RIB	RIB	20.00	0	1	128.00	BB	1	1	6	19810610
106	.1900	RIB	RIB	20.00	0	2	124.00	BB	1	1	6	19810610
107	.1900	RIB	RIB	20.00	0	1	121.00	CO-BD	1	1	6	19810610
108	.1900	RIB	RIB	20.00	0	2	62.00	CO	1	1	6	19810610
109	.1900	RIB	RIB	20.00	0	1	130.00	BB	1	1	6	19810610
110	.1900	RIB	RIB	20.00	0	2	130.00	BB	1	1	6	19810610

EFFORT 1 TORQUES: MIN= 121.00 AVG= 126.00 MAX= 130.00
EFFORT 2 TORQUES: MIN= 8.00 AVG= 90.00 MAX= 130.00

151	.1900	RIB	RIB	20.00	0	1	126.50	BB	1	1	6	19810610
152	.1900	RIB	RIB	20.00	0	2	124.60	CO-BD	1	1	6	19810610
153	.1900	RIB	RIB	20.00	0	1	131.60	BB	1	1	6	19810610
154	.1900	RIB	RIB	20.00	0	2	125.10	CO-BD	1	1	6	19810610
155	.1900	RIB	RIB	20.00	0	1	125.30	BB	1	1	6	19810610
156	.1900	RIB	RIB	20.00	0	2	136.00	BB	1	1	6	19810610
157	.1900	RIB	RIB	20.00	0	1	122.00	BB	1	1	6	19810610
158	.1900	RIB	RIB	20.00	0	2	126.50	BB	1	1	6	19810610
159	.1900	RIB	RIB	20.00	0	1	129.80	BB	1	1	6	19810610
160	.1900	RIB	RIB	20.00	0	2	121.20	CO-BD	1	1	6	19810610

EFFORT 1 TORQUES: MIN= 122.00 AVG= 127.04 MAX= 131.60
EFFORT 2 TORQUES: MIN= 121.20 AVG= 126.68 MAX= 136.00

161	.1900	RIB	RIB	20.00	0	1	114.88	CO-BD	1	1	6	19810617
162	.1900	RIB	RIB	20.00	0	2	71.98	CO-BD	1	1	6	19810617
163	.1900	RIB	RIB	20.00	0	1	119.45	CO-BD	1	1	6	19810617
164	.1900	RIB	RIB	20.00	0	2	86.45	CO-BD	1	1	6	19810617
165	.1900	RIB	RIB	20.00	0	1	120.23	CO-BD	1	1	6	19810617
166	.1900	RIB	RIB	20.00	0	2	71.72	CO	1	1	6	19810617
167	.1900	RIB	RIB	20.00	0	1	116.84	CO-BD	1	1	6	19810617
168	.1900	RIB	RIB	20.00	0	2	84.63	CO	1	1	6	19810617
169	.1900	RIB	RIB	20.00	0	1	115.14	BB	1	1	6	19810617
170	.1900	RIB	RIB	20.00	0	2	118.27	BD	1	1	6	19810617

EFFORT 1 TORQUES: MIN= 114.88 AVG= 117.31 MAX= 120.23
EFFORT 2 TORQUES: MIN= 71.72 AVG= 86.61 MAX= 118.27

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
SB=BROKEN BIT STUCK IN RECESS ST=SCREW TURNED IN FIXTURE

NOTES: MAT 1 = CADMIUM PLATED ALLOY S MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS	END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA	
201	.1900	STD RIB	20.00	0	1	113.90	CO	1	1	6	19810611	*
202	.1900	STD RIB	20.00	0	2	33.10	CO	1	1	6	19810611	*
203	.1900	STD RIB	20.00	0	1	113.10	CO	1	1	6	19810611	*
204	.1900	STD RIB	20.00	0	2	34.00	CO	1	1	6	19810611	*
205	.1900	STD RIB	20.00	0	1	121.00	CO	1	1	6	19810611	*
206	.1900	STD RIB	20.00	0	2	39.60	CO	1	1	6	19810611	*
207	.1900	STD RIB	20.00	0	1	114.50	CO	1	1	6	19810611	*
208	.1900	STD RIB	20.00	0	2	37.30	CO	1	1	6	19810611	*
209	.1900	STD RIB	20.00	0	1	113.20	CO	1	1	6	19810611	*
210	.1900	STD RIB	20.00	0	2	38.30	CO	1	1	6	19810611	*

EFFORT 1 TORQUES: MIN= 113.10 AVG= 115.14 MAX= 121.00
EFFORT 2 TORQUES: MIN= 33.10 AVG= 36.46 MAX= 39.60

251	.1900	STD RIB	20.00	0	1	111.30	CO	1	1	6	19810610
252	.1900	STD RIB	20.00	0	2	85.50	CO	1	1	6	19810610
253	.1900	STD RIB	20.00	0	1	113.50	CO	1	1	6	19810610
254	.1900	STD RIB	20.00	0	2	79.60	CO	1	1	6	19810610
255	.1900	STD RIB	20.00	0	1	116.50	CO	1	1	6	19810610
256	.1900	STD RIB	20.00	0	2	60.00	CO	1	1	6	19810610
257	.1900	STD RIB	20.00	0	1	111.20	CO	1	1	6	19810610
258	.1900	STD RIB	20.00	0	2	91.70	CO	1	1	6	19810610
259	.1900	STD RIB	20.00	0	1	113.20	CO	1	1	6	19810610
260	.1900	STD RIB	20.00	0	2	80.00	CO	1	1	6	19810610

EFFORT 1 TORQUES: MIN= 111.20 AVG= 113.14 MAX= 116.50
EFFORT 2 TORQUES: MIN= 60.00 AVG= 79.36 MAX= 91.70

261	.1900	STD RIB	20.00	0	1	118.66	CO	1	1	7	19810617
262	.1900	STD RIB	20.00	0	2	83.46	CO	1	1	7	19810617
263	.1900	STD RIB	20.00	0	1	116.97	CO	1	1	7	19810617
264	.1900	STD RIB	20.00	0	2	64.94	CO	1	1	7	19810617
265	.1900	STD RIB	20.00	0	1	113.71	CO	1	1	7	19810617
266	.1900	STD RIB	20.00	0	2	90.76	CO	1	1	7	19810617
267	.1900	STD RIB	20.00	0	1	126.23	CO	1	1	7	19810617
268	.1900	STD RIB	20.00	0	2	64.68	CO	1	1	7	19810617
269	.1900	STD RIB	20.00	0	1	117.23	CO	1	1	7	19810617
270	.1900	STD RIB	20.00	0	2	90.24	CO	1	1	7	19810617

EFFORT 1 TORQUES: MIN= 113.71 AVG= 118.56 MAX= 126.23
EFFORT 2 TORQUES: MIN= 64.68 AVG= 78.82 MAX= 90.76

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
SB=BROKEN BIT STUCK IN RECESS ST=SCREW TURNED IN FIXTURE

NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL
*=EFFORT 1 BIT REUSED FOR EFFORT 2

TEST NUMBER	DIAMETER INCHES	BIT-RECESS		END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA	
301	.1900	RIB	RIB	20.00	0	1	120.50	CO-BD	2	1	6	19810609	
302	.1900	RIB	RIB	20.00	0	2	61.10	CO	2	1	6	19810609	
303	.1900	RIB	RIB	20.00	0	1	127.60	BB	2	1	6	19810609	
304	.1900	RIB	RIB	20.00	0	2	120.20	CO-BD	2	1	6	19810609	
305	.1900	RIB	RIB	20.00	0	1	131.20	BB	2	1	6	19810609	
306	.1900	RIB	RIB	20.00	0	2	116.50	BB	2	1	6	19810609	
307	.1900	RIB	RIB	20.00	0	1	127.90	BB	2	1	6	19810609	
308	.1900	RIB	RIB	20.00	0	2	118.70	CO-BD	2	1	6	19810609	
309	.1900	RIB	RIB	20.00	0	1	130.80	CO-BD	2	1	6	19810609	
310	.1900	RIB	RIB	20.00	0	2	116.60	CO	2	1	6	19810609	
EFFORT 1 TORQUES: MIN= 120.50 AVG= 127.60 MAX= 131.20													
EFFORT 2 TORQUES: MIN= 61.10 AVG= 106.62 MAX= 120.20													
351	.1900	RIB	RIB	20.00	0	1	125.21	CO-BD	2	1	7	19810625	
352	.1900	RIB	RIB	20.00	0	2	63.91	CO	2	1	7	19810625	
353	.1900	RIB	RIB	20.00	0	1	125.99	CO-BD	2	1	7	19810625	
354	.1900	RIB	RIB	20.00	0	2	49.93	CO	2	1	7	19810625	
355	.1900	RIB	RIB	20.00	0	1	121.69	BB	2	1	7	19810625	
356	.1900	RIB	RIB	20.00	0	2	127.17	CO-BD	2	1	7	19810625	
357	.1900	RIB	RIB	20.00	0	1	118.41	BB	2	1	7	19810625	
358	.1900	RIB	RIB	20.00	0	2	115.14	CO-BD	2	1	7	19810625	
359	.1900	RIB	RIB	20.00	0	1	117.62	CO-BD	2	1	7	19810625	
360	.1900	RIB	RIB	20.00	0	2	25.10	CO	2	1	7	19810625	
EFFORT 1 TORQUES: MIN= 117.62 AVG= 121.78 MAX= 125.99													
EFFORT 2 TORQUES: MIN= 25.10 AVG= 76.25 MAX= 127.17													
401	.1900	STD	RIB	20.00	0	1	122.20	CO	2	1	6	19810609	*
402	.1900	STD	RIB	20.00	0	2	21.00	CO	2	1	6	19810609	*
403	.1900	STD	RIB	20.00	0	1	113.70	CO	2	1	6	19810609	*
404	.1900	STD	RIB	20.00	0	2	44.00	CO	2	1	6	19810609	*
405	.1900	STD	RIB	20.00	0	1	120.00	CO	2	1	6	19810609	*
406	.1900	STD	RIB	20.00	0	2	35.70	CO	2	1	6	19810609	*
407	.1900	STD	RIB	20.00	0	1	122.60	CO	2	1	6	19810609	*
408	.1900	STD	RIB	20.00	0	2	34.50	CO	2	1	6	19810609	*
409	.1900	STD	RIB	20.00	0	1	110.30	CO	2	1	6	19810609	*
410	.1900	STD	RIB	20.00	0	2	32.20	CO	2	1	6	19810609	*
EFFORT 1 TORQUES: MIN= 110.30 AVG= 117.76 MAX= 122.60													
EFFORT 2 TORQUES: MIN= 21.00 AVG= 33.48 MAX= 44.00													

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
SB=BROKEN BIT STUCK IN RECESS ST=SCREW TURNED IN FIXTURE

NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL
*=EFFORT 1 BIT REUSED FOR EFFORT 2

TEST NUMBER	DIAMETER INCHES	BIT-RECESS	END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
451	.1900	STD RIB	20.00	0	1	122.80	CO	2	1	6	19810611
452	.1900	STD RIB	20.00	0	2	96.20	CO	2	1	6	19810611
453	.1900	STD RIB	20.00	0	1	92.00	CO	2	1	6	19810611
454	.1900	STD RIB	20.00	0	2	102.90	CO	2	1	6	19810611
455	.1900	STD RIB	20.00	0	1	102.20	CO	2	1	6	19810611
456	.1900	STD RIB	20.00	0	2	97.20	CO	2	1	6	19810611
457	.1900	STD RIB	20.00	0	1	121.90	CO	2	1	6	19810611
458	.1900	STD RIB	20.00	0	2	93.80	CO	2	1	6	19810611
459	.1900	STD RIB	20.00	0	1	116.40	CO	2	1	6	19810611
460	.1900	STD RIB	20.00	0	2	91.00	CO	2	1	6	19810611

EFFORT 1 TORQUES: MIN= 92.00 AVG= 111.06 MAX= 122.80
EFFORT 2 TORQUES: MIN= 91.00 AVG= 96.22 MAX= 102.90

461	.1900	STD RIB	20.00	0	1	108.18	CO	2	1	7	19810618
462	.1900	STD RIB	20.00	0	2	92.92	CO	2	1	7	19810618
463	.1900	STD RIB	20.00	0	1	126.58	CO	2	1	7	19810618
464	.1900	STD RIB	20.00	0	2	76.73	CO	2	1	7	19810618
465	.1900	STD RIB	20.00	0	1	112.75	CO	2	1	7	19810618
466	.1900	STD RIB	20.00	0	2	52.07	CO	2	1	7	19810618
467	.1900	STD RIB	20.00	0	1	120.19	CO	2	1	7	19810618
468	.1900	STD RIB	20.00	0	2	99.57	CO	2	1	7	19810618
469	.1900	STD RIB	20.00	0	1	121.23	CO	2	1	7	19810618
470	.1900	STD RIB	20.00	0	2	89.91	CO	2	1	7	19810618

EFFORT 1 TORQUES: MIN= 108.18 AVG= 117.79 MAX= 126.58
EFFORT 2 TORQUES: MIN= 52.07 AVG= 82.24 MAX= 99.57

501	.1900	RIB STD	20.00	0	1	125.50	CO-BB	3	1	6	19810609
502	.1900	RIB STD	20.00	0	2	26.40	CO	3	1	6	19810609
503	.1900	RIB STD	20.00	0	1	129.00	BB	3	1	6	19810609
504	.1900	RIB STD	20.00	0	2	115.00	BB	3	1	6	19810609
505	.1900	RIB STD	20.00	0	1	123.70	BD	3	1	6	19810609
506	.1900	RIB STD	20.00	0	2	120.20	BB	3	1	6	19810609
507	.1900	RIB STD	20.00	0	1	121.20	BD	3	1	6	19810609
508	.1900	RIB STD	20.00	0	2	114.10	CO-BD	3	1	6	19810609
509	.1900	RIB STD	20.00	0	1	125.30	BB	3	1	6	19810609
510	.1900	RIB STD	20.00	0	2	98.60	CO-BD	3	1	6	19810609

EFFORT 1 TORQUES: MIN= 121.20 AVG= 124.94 MAX= 129.00
EFFORT 2 TORQUES: MIN= 26.40 AVG= 94.86 MAX= 120.20

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
SB=BROKEN BIT STUCK IN RECESS ST=SCREW TURNED IN FIXTURE

NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS	END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
551	.1900	RIB STD	20.00	0	1	116.27	CO-BD	3	1	7	19810618
552	.1900	RIB STD	20.00	0	2	55.33	CO	3	1	7	19810618
553	.1900	RIB STD	20.00	0	1	119.67	BB	3	1	7	19810618
554	.1900	RIB STD	20.00	0	2	111.06	CO	3	1	7	19810618
555	.1900	RIB STD	20.00	0	1	112.75	BB	3	1	7	19810618
556	.1900	RIB STD	20.00	0	2	108.84	CO-BD	3	1	7	19810618

EFFORT 1 TORQUES: MIN= 112.75 AVG= 116.23 MAX= 119.67
EFFORT 2 TORQUES: MIN= 55.33 AVG= 91.74 MAX= 111.06

601	.1900	STD STD	20.00	0	1	118.10	CO	3	1	6	19810609
602	.1900	STD STD	20.00	0	2	31.50	CO	3	1	6	19810609
603	.1900	STD STD	20.00	0	1	112.00	CO-BD	3	1	6	19810609
604	.1900	STD STD	20.00	0	2	88.50	CO	3	1	6	19810609
605	.1900	STD STD	20.00	0	1	110.40	CO	3	1	6	19810609
606	.1900	STD STD	20.00	0	2	26.30	CO	3	1	6	19810609
607	.1900	STD STD	20.00	0	1	106.90	CO-BD	3	1	6	19810609
608	.1900	STD STD	20.00	0	2	64.90	CO	3	1	6	19810609
609	.1900	STD STD	20.00	0	1	111.50	CO-BD	3	1	6	19810609
610	.1900	STD STD	20.00	0	2	89.30	CO	3	1	6	19810609

EFFORT 1 TORQUES: MIN= 106.90 AVG= 111.78 MAX= 118.10
EFFORT 2 TORQUES: MIN= 26.30 AVG= 60.10 MAX= 89.30

701	.1900	RIB STD	20.00	0	1	106.80	BB	4	1	6	19810609
702	.1900	RIB STD	20.00	0	2	87.70	BB	4	1	6	19810609
703	.1900	RIB STD	20.00	0	1	111.30	BB	4	1	6	19810609
704	.1900	RIB STD	20.00	0	2	100.50	BB	4	1	6	19810609
705	.1900	RIB STD	20.00	0	1	105.40	BB	4	1	6	19810609
706	.1900	RIB STD	20.00	0	2	80.60	BB	4	1	6	19810609
707	.1900	RIB STD	20.00	0	1	118.10	BB	4	1	6	19810609
708	.1900	RIB STD	20.00	0	2	121.10	CO-BD	4	1	6	19810609
709	.1900	RIB STD	20.00	0	1	102.90	CO-BD	4	1	6	19810609
710	.1900	RIB STD	20.00	0	2	4.40	CO	4	1	6	19810609

EFFORT 1 TORQUES: MIN= 102.90 AVG= 108.90 MAX= 118.10
EFFORT 2 TORQUES: MIN= 4.40 AVG= 78.86 MAX= 121.10

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
SB=BROKEN BIT STUCK IN RECESS ST=SCREW TURNED IN FIXTURE

NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS		END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
751	.1900	RIB	STD	20.00	0	1	116.01	BB	4	1	7	19810618
752	.1900	RIB	STD	20.00	0	2	113.14	BB	4	1	7	19810618
753	.1900	RIB	STD	20.00	0	1	113.53	BB	4	1	7	19810618
754	.1900	RIB	STD	20.00	0	2	120.06	BB	4	1	7	19810618
755	.1900	RIB	STD	20.00	0	1	114.97	CO-BD	4	1	7	19810618
756	.1900	RIB	STD	20.00	0	2	0.00	SB	4	1	7	19810618
757	.1900	RIB	STD	20.00	0	1	116.27	BD	4	1	7	19810618
758	.1900	RIB	STD	20.00	0	2	104.92	CO	4	1	7	19810618
759	.1900	RIB	STD	20.00	0	1	121.36	CO	4	1	7	19810618
760	.1900	RIB	STD	20.00	0	2	89.26	CO	4	1	7	19810618

EFFORT 1 TORQUES: MIN= 113.53 AVG= 116.43 MAX= 121.36
EFFORT 2 TORQUES: MIN= 89.26 AVG= 106.85 MAX= 120.06

801	.1900	STD	STD	20.00	0	1	113.80	CO	4	1	6	19810600
802	.1900	STD	STD	20.00	0	2	77.00	CO	4	1	6	19810600
803	.1900	STD	STD	20.00	0	1	107.00	CO	4	1	6	19810600
804	.1900	STD	STD	20.00	0	2	46.90	CO	4	1	6	19810600
805	.1900	STD	STD	20.00	0	1	115.20	CO	4	1	6	19810600
806	.1900	STD	STD	20.00	0	2	91.20	CO	4	1	6	19810600
807	.1900	STD	STD	20.00	0	1	109.90	CO	4	1	6	19810600
808	.1900	STD	STD	20.00	0	2	99.90	CO	4	1	6	19810600
809	.1900	STD	STD	20.00	0	1	115.90	CO	4	1	6	19810600
810	.1900	STD	STD	20.00	0	2	65.00	CO	4	1	6	19810600

EFFORT 1 TORQUES: MIN= 107.00 AVG= 112.36 MAX= 115.90
EFFORT 2 TORQUES: MIN= 46.90 AVG= 76.00 MAX= 99.90

851	.1900	STD	STD	20.00	0	1	121.98	CO	4	1	7	19810618
852	.1900	STD	STD	20.00	0	2	102.39	CO	4	1	7	19810618
853	.1900	STD	STD	20.00	0	1	120.15	CO	4	1	7	19810618
854	.1900	STD	STD	20.00	0	2	92.72	CO	4	1	7	19810618
855	.1900	STD	STD	20.00	0	1	115.97	CO	4	1	7	19810618
856	.1900	STD	STD	20.00	0	2	102.65	CO	4	1	7	19810618
857	.1900	STD	STD	20.00	0	1	122.89	CO	4	1	7	19810618
858	.1900	STD	STD	20.00	0	2	89.07	CO	4	1	7	19810618
859	.1900	STD	STD	20.00	0	1	116.88	CO	4	1	7	19810618
860	.1900	STD	STD	20.00	0	2	108.66	CO	4	1	7	19810618

EFFORT 1 TORQUES: MIN= 115.97 AVG= 119.57 MAX= 122.89
EFFORT 2 TORQUES: MIN= 89.07 AVG= 99.10 MAX= 108.66

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
SB=BROKEN BIT STUCK IN RECESS ST=SCREW TURNED IN FIXTURE

NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS		END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
901	.1900	RIB	STD	20.00	0	1	135.70	BB	5	1	6	19810609
902	.1900	RIB	STD	20.00	0	2	137.70	BB	5	1	6	19810609
905	.1900	RIB	STD	20.00	0	1	138.80	BB	5	1	6	19810609
906	.1900	RIB	STD	20.00	0	2	137.80	BB	5	1	6	19810609
907	.1900	RIB	STD	20.00	0	1	137.30	BB	5	1	6	19810609
908	.1900	RIB	STD	20.00	0	2	140.10	BB	5	1	6	19810609
909	.1900	RIB	STD	20.00	0	1	136.70	BB	5	1	6	19810609
910	.1900	RIB	STD	20.00	0	2	114.20	BB	5	1	6	19810609
911	.1900	RIB	STD	20.00	0	1	132.00	BB	5	1	6	19810609
912	.1900	RIB	STD	20.00	0	2	0.00	SB	5	1	6	19810609

EFFORT 1 TORQUES: MIN= 132.00 AVG= 136.10 MAX= 138.80
EFFORT 2 TORQUES: MIN= 114.20 AVG= 132.45 MAX= 140.10

951	.1900	RIB	STD	20.00	0	1	118.10	BB	5	1	7	19810618
952	.1900	RIB	STD	20.00	0	2	129.06	CO-BD	5	1	7	19810618
953	.1900	RIB	STD	20.00	0	1	112.23	BB	5	1	7	19810618
954	.1900	RIB	STD	20.00	0	2	99.44	BB	5	1	7	19810618
955	.1900	RIB	STD	20.00	0	1	116.27	BB	5	1	7	19810618
956	.1900	RIB	STD	20.00	0	2	131.28	CO-BD	5	1	7	19810618
957	.1900	RIB	STD	20.00	0	1	121.36	CO	5	1	7	19810618
958	.1900	RIB	STD	20.00	0	2	21.92	CO	5	1	7	19810618
959	.1900	RIB	STD	20.00	0	1	122.29	BB	5	1	7	19810618
960	.1900	RIB	STD	20.00	0	2	120.45	BB	5	1	7	19810618

EFFORT 1 TORQUES: MIN= 112.23 AVG= 118.05 MAX= 122.29
EFFORT 2 TORQUES: MIN= 21.92 AVG= 100.43 MAX= 131.28

1001	.1900	STD	STD	20.00	0	1	110.80	CO-BD	5	1	6	19810609
1002	.1900	STD	STD	20.00	0	2	91.80	CO	5	1	6	19810609
1003	.1900	STD	STD	20.00	0	1	108.60	CO-BD	5	1	6	19810609
1004	.1900	STD	STD	20.00	0	2	92.70	CO	5	1	6	19810609
1005	.1900	STD	STD	20.00	0	1	124.50	CO-BD	5	1	6	19810609
1006	.1900	STD	STD	20.00	0	2	93.40	CO	5	1	6	19810609
1007	.1900	STD	STD	20.00	0	1	120.10	CO-BD	5	1	6	19810609
1008	.1900	STD	STD	20.00	0	2	92.30	CO	5	1	6	19810609
1009	.1900	STD	STD	20.00	0	1	114.70	CO-BD	5	1	6	19810609
1010	.1900	STD	STD	20.00	0	2	102.40	CO	5	1	6	19810609

EFFORT 1 TORQUES: MIN= 108.60 AVG= 115.74 MAX= 124.50
EFFORT 2 TORQUES: MIN= 91.80 AVG= 94.52 MAX= 102.40

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
SB=BROKEN BIT STUCK IN RECESS ST=SCREW TURNED IN FIXTURE

NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT	RECESS	END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
1051	.1900	STD	STD	20.00	0	1	122.09	CO	5	1	7	19810600
1052	.1900	STD	STD	20.00	0	2	114.67	CO	5	1	7	19810600
1053	.1900	STD	STD	20.00	0	1	124.70	CO	5	1	7	19810600
1054	.1900	STD	STD	20.00	0	2	104.24	CO	5	1	7	19810600
1055	.1900	STD	STD	20.00	0	1	126.27	CO	5	1	7	19810600
1056	.1900	STD	STD	20.00	0	2	100.46	CO	5	1	7	19810600
1057	.1900	STD	STD	20.00	0	1	118.19	CO	5	1	7	19810600
1058	.1900	STD	STD	20.00	0	2	101.51	CO	5	1	7	19810600
1059	.1900	STD	STD	20.00	0	1	121.70	CO	5	1	7	19810600
1060	.1900	STD	STD	20.00	0	2	114.02	CO	5	1	7	19810600

EFFORT 1 TORQUES: MIN= 118.19 AVG= 122.59 MAX= 126.27
EFFORT 2 TORQUES: MIN= 100.46 AVG= 106.98 MAX= 114.67

1101	.1900	RIB	STD	20.00	0	1	136.80	BB	6	1	6	19810609
1102	.1900	RIB	STD	20.00	0	2	140.60	BB	6	1	6	19810609
1103	.1900	RIB	STD	20.00	0	1	132.90	BB	6	1	6	19810609
1104	.1900	RIB	STD	20.00	0	2	128.30	BB	6	1	6	19810609
1105	.1900	RIB	STD	20.00	0	1	132.40	BB	6	1	6	19810609
1106	.1900	RIB	STD	20.00	0	2	123.70	BB	6	1	6	19810609
1107	.1900	RIB	STD	20.00	0	1	132.40	BB	6	1	6	19810609
1108	.1900	RIB	STD	20.00	0	2	88.90	SB	6	1	6	19810609
1109	.1900	RIB	STD	20.00	0	1	137.40	BB	6	1	6	19810609
1110	.1900	RIB	STD	20.00	0	2	130.50	BB	6	1	6	19810609

EFFORT 1 TORQUES: MIN= 132.40 AVG= 134.38 MAX= 137.40
EFFORT 2 TORQUES: MIN= 88.90 AVG= 122.40 MAX= 140.60

1151	.1900	RIB	STD	20.00	0	1	128.57	BB	6	1	7	19810600
1152	.1900	RIB	STD	20.00	0	2	121.79	BB	6	1	7	19810600
1153	.1900	RIB	STD	20.00	0	1	112.14	BB	6	1	7	19810600
1154	.1900	RIB	STD	20.00	0	2	118.79	CO-BD	6	1	7	19810600
1155	.1900	RIB	STD	20.00	0	1	131.18	CO	6	1	7	19810600
1156	.1900	RIB	STD	20.00	0	2	20.34	CO	6	1	7	19810600
1157	.1900	RIB	STD	20.00	0	1	129.23	CO	6	1	7	19810600
1158	.1900	RIB	STD	20.00	0	2	20.34	CO	6	1	7	19810600
1159	.1900	RIB	STD	20.00	0	1	125.71	BB	6	1	7	19810600
1160	.1900	RIB	STD	20.00	0	2	130.92	BB	6	1	7	19810600

EFFORT 1 TORQUES: MIN= 112.14 AVG= 125.37 MAX= 131.18
EFFORT 2 TORQUES: MIN= 20.34 AVG= 84.10 MAX= 130.92

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
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NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS		END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
1201	.1900	STD	STD	20.00	0	1	108.40	CO-BD	6	1	6	19810600
1202	.1900	STD	STD	20.00	0	2	92.20	CO	6	1	6	19810600
1203	.1900	STD	STD	20.00	0	1	118.40	CO-BD	6	1	6	19810600
1204	.1900	STD	STD	20.00	0	2	90.30	CO	6	1	6	19810600
1205	.1900	STD	STD	20.00	0	1	106.00	CO	6	1	6	19810600
1206	.1900	STD	STD	20.00	0	2	98.70	CO	6	1	6	19810600
1207	.1900	STD	STD	20.00	0	1	116.50	CO	6	1	6	19810600
1208	.1900	STD	STD	20.00	0	2	96.50	CO	6	1	6	19810600
1209	.1900	STD	STD	20.00	0	1	115.10	CO	6	1	6	19810600
1210	.1900	STD	STD	20.00	0	2	41.60	CO	5	1	6	19810600
	EFFORT 1 TORQUES: MIN= 106.00 AVG= 112.88 MAX= 118.40											
	EFFORT 2 TORQUES: MIN= 41.60 AVG= 83.86 MAX= 98.70											
1251	.1900	STD	STD	20.00	0	1	109.31	CO	6	1	7	19810618
1252	.1900	STD	STD	20.00	0	2	98.20	CO	6	1	7	19810618
1253	.1900	STD	STD	20.00	0	1	117.15	CO	6	1	7	19810618
1254	.1900	STD	STD	20.00	0	2	70.26	CO	6	1	7	19810618
1255	.1900	STD	STD	20.00	0	1	121.72	CO	6	1	7	19810618
1256	.1900	STD	STD	20.00	0	2	102.26	CO	6	1	7	19810618
1257	.1900	STD	STD	20.00	0	1	122.50	CO	6	1	7	19810618
1258	.1900	STD	STD	20.00	0	2	75.09	CO	6	1	7	19810618
1259	.1900	STD	STD	20.00	0	1	112.57	CO	6	1	7	19810618
1260	.1900	STD	STD	20.00	0	2	87.50	CO	6	1	7	19810618
	EFFORT 1 TORQUES: MIN= 109.31 AVG= 116.65 MAX= 122.50											
	EFFORT 2 TORQUES: MIN= 70.26 AVG= 86.66 MAX= 102.26											
1401	.2500	RIB	RIB	20.00	0	1	332.80	CO-BD	7	1	6	19810611
1402	.2500	RIB	RIB	20.00	0	2	4.40	CO	7	1	6	19810611
1403	.2500	RIB	RIB	20.00	0	1	347.20	BB	7	1	6	19810611
1404	.2500	RIB	RIB	20.00	0	2	284.20	CO-BD	7	1	6	19810611
1405	.2500	RIB	RIB	20.00	0	1	336.20	CO-BD	7	1	6	19810611
1406	.2500	RIB	RIB	20.00	0	2	9.00	CO	7	1	6	19810611
1407	.2500	RIB	RIB	20.00	0	1	336.00	BB	7	1	6	19810611
1408	.2500	RIB	RIB	20.00	0	2	341.00	BB	7	1	6	19810611
1409	.2500	RIB	RIB	20.00	0	1	332.80	CO-BB	7	1	6	19810611
1410	.2500	RIB	RIB	20.00	0	2	8.40	CO	7	1	6	19810611
	EFFORT 1 TORQUES: MIN= 332.80 AVG= 337.40 MAX= 347.20											
	EFFORT 2 TORQUES: MIN= 4.40 AVG= 129.40 MAX= 341.00											

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
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NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS		END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
1451	.2500	RIB	RIB	20.00	0	1	0.00	ST	7	1	7	19810624
1452	.2500	RIB	RIB	20.00	0	2	313.41	CO	7	1	7	19810624
1453	.2500	RIB	RIB	20.00	0	1	306.64	BB	7	1	7	19810624
1454	.2500	RIB	RIB	20.00	0	2	26.04	CO-BD	7	1	7	19810624
1455	.2500	RIB	RIB	20.00	0	1	336.72	BB	7	1	7	19810624
1456	.2500	RIB	RIB	20.00	0	2	325.52	CO	7	1	7	19810624
1457	.2500	RIB	RIB	20.00	0	1	0.00	ST	7	1	7	19810624
1458	.2500	RIB	RIB	20.00	0	2	246.09	BD	7	1	7	19810624
1459	.2500	RIB	RIB	20.00	0	1	0.00	ST	7	1	7	19810624

EFFORT 1 TORQUES: MIN= 306.64 AVG= 321.68 MAX= 336.72
EFFORT 2 TORQUES: MIN= 26.04 AVG= 227.77 MAX= 325.52

1501	.2500	STD	RIB	20.00	0	1	305.90	CO	7	1	6	19810611
1502	.2500	STD	RIB	20.00	0	2	27.10	CO	7	1	6	19810611
1503	.2500	STD	RIB	20.00	0	1	295.40	CO	7	1	6	19810611
1504	.2500	STD	RIB	20.00	0	2	187.60	CO	7	1	6	19810611
1505	.2500	STD	RIB	20.00	0	1	245.20	CO	7	1	6	19810611
1506	.2500	STD	RIB	20.00	0	2	207.00	CO	7	1	6	19810611
1507	.2500	STD	RIB	20.00	0	1	275.80	CO	7	1	6	19810611
1508	.2500	STD	RIB	20.00	0	2	140.70	CO	7	1	6	19810611
1509	.2500	STD	RIB	20.00	0	1	301.50	CO	7	1	6	19810611
1510	.2500	STD	RIB	20.00	0	2	168.40	CO	7	1	6	19810611

EFFORT 1 TORQUES: MIN= 245.20 AVG= 284.76 MAX= 305.90
EFFORT 2 TORQUES: MIN= 27.10 AVG= 146.16 MAX= 207.00

1551	.2500	STD	RIB	20.00	0	1	252.52	CO	7	1	7	19810624
1552	.2500	STD	RIB	20.00	0	2	170.56	CO	7	1	7	19810624
1553	.2500	STD	RIB	20.00	0	1	261.39	CO	7	1	7	19810624
1554	.2500	STD	RIB	20.00	0	2	197.27	CO	7	1	7	19810624
1555	.2500	STD	RIB	20.00	0	1	261.39	CO	7	1	7	19810624
1556	.2500	STD	RIB	20.00	0	2	45.28	CO	7	1	7	19810624
1557	.2500	STD	RIB	20.00	0	1	261.13	CO	7	1	7	19810624
1558	.2500	STD	RIB	20.00	0	2	148.38	CO	7	1	7	19810624
1559	.2500	STD	RIB	20.00	0	1	275.61	CO	7	1	7	19810624
1560	.2500	STD	RIB	20.00	0	2	181.26	CO	7	1	7	19810624

EFFORT 1 TORQUES: MIN= 252.52 AVG= 262.41 MAX= 275.61
EFFORT 2 TORQUES: MIN= 45.28 AVG= 146.55 MAX= 187.27

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
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NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS		END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
1601	.2500	STD	STD	20.00	0	1	287.10	CO	8	1	6	19810611
1602	.2500	STD	STD	20.00	0	2	51.30	CO	8	1	6	19810611
1603	.2500	STD	STD	20.00	0	1	228.20	CO	8	1	6	19810611
1604	.2500	STD	STD	20.00	0	2	164.90	CO	8	1	6	19810611
1605	.2500	STD	STD	20.00	0	1	249.70	CO	8	1	6	19810611
1606	.2500	STD	STD	20.00	0	2	186.60	CO	8	1	6	19810611
1607	.2500	STD	STD	20.00	0	1	238.80	CO	8	1	6	19810611
1608	.2500	STD	STD	20.00	0	2	91.00	CO	8	1	6	19810611
1609	.2500	STD	STD	20.00	0	1	236.10	CO	8	1	6	19810611
1610	.2500	STD	STD	20.00	0	2	165.40	CO	8	1	6	19810611

EFFORT 1 TORQUES: MIN= 228.20 AVG= 247.98 MAX= 287.10
EFFORT 2 TORQUES: MIN= 51.30 AVG= 131.84 MAX= 186.60

1651	.2500	STD	STD	20.00	0	1	196.02	CO	8	1	7	19810625
1652	.2500	STD	STD	20.00	0	2	32.12	CO	8	1	7	19810625
1653	.2500	STD	STD	20.00	0	1	232.20	CO	8	1	7	19810625
1654	.2500	STD	STD	20.00	0	2	163.11	CO	8	1	7	19810625
1655	.2500	STD	STD	20.00	0	1	207.91	CO	8	1	7	19810625
1656	.2500	STD	STD	20.00	0	2	156.32	CO	8	1	7	19810625
1657	.2500	STD	STD	20.00	0	1	231.68	CO	8	1	7	19810625
1658	.2500	STD	STD	20.00	0	2	140.91	CO	8	1	7	19810625
1659	.2500	STD	STD	20.00	0	1	206.60	CO	8	1	7	19810625
1660	.2500	STD	STD	20.00	0	2	62.68	CO	8	1	7	19810625

EFFORT 1 TORQUES: MIN= 196.02 AVG= 214.88 MAX= 232.20
EFFORT 2 TORQUES: MIN= 32.12 AVG= 111.03 MAX= 163.11

1701	.2500	RIB	STD	20.00	0	1	305.20	CO-BD	8	1	6	19810611
1702	.2500	RIB	STD	20.00	0	2	60.20	CO	8	1	6	19810611
1703	.2500	RIB	STD	20.00	0	1	315.70	BB	8	1	6	19810611
1704	.2500	RIB	STD	20.00	0	2	278.20	CO-BD	8	1	6	19810611
1705	.2500	RIB	STD	20.00	0	1	311.00	CO-BD	8	1	6	19810611
1706	.2500	RIB	STD	20.00	0	2	9.20	CO	8	1	6	19810611
1707	.2500	RIB	STD	20.00	0	1	320.60	CO-BD	8	1	6	19810611
1708	.2500	RIB	STD	20.00	0	2	11.00	CO	8	1	6	19810611
1709	.2500	RIB	STD	20.00	0	1	315.90	CO-BD	8	1	6	19810611
1710	.2500	RIB	STD	20.00	0	2	15.30	CO	8	1	6	19810611

EFFORT 1 TORQUES: MIN= 305.20 AVG= 313.68 MAX= 320.60
EFFORT 2 TORQUES: MIN= 9.20 AVG= 74.78 MAX= 278.20

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
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NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS		END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
1751	.2500	RIB	STD	20.00	0	1	321.39	BB	8	1	7	19810625
1752	.2500	RIB	STD	20.00	0	2	292.28	CO	8	1	7	19810625
1753	.2500	RIB	STD	20.00	0	1	338.64	BB	8	1	7	19810625
1754	.2500	RIB	STD	20.00	0	2	324.14	BD	8	1	7	19810625
1755	.2500	RIB	STD	20.00	0	1	330.41	CO-BD	8	1	7	19810625
1756	.2500	RIB	STD	20.00	0	2	5.09	CO	8	1	7	19810625
1757	.2500	RIB	STD	20.00	0	1	322.18	CO	8	1	7	19810625
1758	.2500	RIB	STD	20.00	0	2	11.88	CO	8	1	7	19810625
1759	.2500	RIB	STD	20.00	0	1	323.49	CO-BD	8	1	7	19810625
1760	.2500	RIB	STD	20.00	0	2	10.45	CO-BD	8	1	7	19810625

EFFORT 1 TORQUES: MIN= 321.39 AVG= 327.22 MAX= 338.64
EFFORT 2 TORQUES: MIN= 5.09 AVG= 128.77 MAX= 324.14

1801	.2500	STD	STD	20.00	0	1	249.70	CO	9	1	6	19810611
1802	.2500	STD	STD	20.00	0	2	221.80	CO	9	1	6	19810611
1803	.2500	STD	STD	20.00	0	1	268.00	CO	9	1	6	19810611
1804	.2500	STD	STD	20.00	0	2	171.60	CO	9	1	6	19810611
1805	.2500	STD	STD	20.00	0	1	321.50	CO	9	1	6	19810611
1806	.2500	STD	STD	20.00	0	2	55.60	CO	9	1	6	19810611
1807	.2500	STD	STD	20.00	0	1	294.00	CO	9	1	6	19810611
1808	.2500	STD	STD	20.00	0	2	166.90	CO	9	1	6	19810611
1809	.2500	STD	STD	20.00	0	1	263.50	CO	9	1	6	19810611
1810	.2500	STD	STD	20.00	0	2	171.10	CO	9	1	6	19810611

EFFORT 1 TORQUES: MIN= 249.70 AVG= 279.34 MAX= 321.50
EFFORT 2 TORQUES: MIN= 55.60 AVG= 157.40 MAX= 221.80

1851	.2500	STD	STD	20.00	0	1	245.78	CO	9	1	7	19810625
1852	.2500	STD	STD	20.00	0	2	200.33	CO	9	1	7	19810625
1853	.2500	STD	STD	20.00	0	1	218.62	CO	9	1	7	19810625
1854	.2500	STD	STD	20.00	0	2	94.16	CO	9	1	7	19810625
1855	.2500	STD	STD	20.00	0	1	270.85	CO	9	1	7	19810625
1856	.2500	STD	STD	20.00	0	2	161.68	CO	9	1	7	19810625
1857	.2500	STD	STD	20.00	0	1	241.86	CO	9	1	7	19810625
1858	.2500	STD	STD	20.00	0	2	201.90	CO	9	1	7	19810625
1859	.2500	STD	STD	20.00	0	1	220.84	CO	9	1	7	19810625
1860	.2500	STD	STD	20.00	0	2	173.04	CO	9	1	7	19810625

EFFORT 1 TORQUES: MIN= 218.62 AVG= 239.59 MAX= 270.85
EFFORT 2 TORQUES: MIN= 94.16 AVG= 166.22 MAX= 201.90

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
SB=BROKEN BIT STUCK IN RECESS ST=SCREW TURNED IN FIXTURE

NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS		END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
1901	.2500	RIB	STD	20.00	0	1	330.80	CO-BD	9	1	6	19810611
1902	.2500	RIB	STD	20.00	0	2	5.70	CO	9	1	6	19810611
1903	.2500	RIB	STD	20.00	0	1	333.30	CO-BD	9	1	6	19810611
1904	.2500	RIB	STD	20.00	0	2	6.20	CO	9	1	6	19810611
1905	.2500	RIB	STD	20.00	0	1	319.60	CO-BD	9	1	6	19810611
1906	.2500	RIB	STD	20.00	0	2	11.00	CO	9	1	6	19810611
1907	.2500	RIB	STD	20.00	0	1	331.10	BB	9	1	6	19810611
1908	.2500	RIB	STD	20.00	0	2	313.60	CO-BD	9	1	6	19810611
1909	.2500	RIB	STD	20.00	0	1	338.60	CO-BD	9	1	6	19810611
1910	.2500	RIB	STD	20.00	0	2	10.60	CO	9	1	6	19810611

EFFORT 1 TORQUES: MIN= 319.60 AVG= 330.68 MAX= 338.60
EFFORT 2 TORQUES: MIN= 5.70 AVG= 69.42 MAX= 313.60

1951	.2500	RIB	STD	20.00	0	1	344.51	BB	9	1	7	19810624
1952	.2500	RIB	STD	20.00	0	2	359.79	BB	9	1	7	19810624
1953	.2500	RIB	STD	20.00	0	1	342.42	CO	9	1	7	19810624
1954	.2500	RIB	STD	20.00	0	2	32.78	CO	9	1	7	19810624
1955	.2500	RIB	STD	20.00	0	1	343.47	BB	9	1	7	19810624
1956	.2500	RIB	STD	20.00	0	2	315.00	CO	9	1	7	19810624
1957	.2500	RIB	STD	20.00	0	1	337.72	BB	9	1	7	19810624
1958	.2500	RIB	STD	20.00	0	2	340.73	BB	9	1	7	19810624
1959	.2500	RIB	STD	20.00	0	1	342.56	CO-BD	9	1	7	19810624
1960	.2500	RIB	STD	20.00	0	2	4.96	CO	9	1	7	19810624

EFFORT 1 TORQUES: MIN= 337.72 AVG= 342.14 MAX= 344.51
EFFORT 2 TORQUES: MIN= 4.96 AVG= 210.65 MAX= 359.79

2101	.1900	RIB	RIB	10.00	0	1	124.30	BB	1	1	6	19810615
2102	.1900	RIB	RIB	10.00	0	2	119.00	CO-BD	1	1	6	19810615
2103	.1900	RIB	RIB	10.00	0	1	127.60	CO-BD	1	1	6	19810615
2104	.1900	RIB	RIB	10.00	0	2	2.50	CO	1	1	6	19810615
2105	.1900	RIB	RIB	10.00	0	1	123.10	CO-BD	1	1	6	19810615
2106	.1900	RIB	RIB	10.00	0	2	3.40	CO	1	1	6	19810615
2107	.1900	RIB	RIB	10.00	0	1	130.00	CO-BD	1	1	6	19810615
2108	.1900	RIB	RIB	10.00	0	2	52.10	CO	1	1	6	19810615
2109	.1900	RIB	RIB	10.00	0	1	126.40	BB	1	1	6	19810615
2110	.1900	RIB	RIB	10.00	0	2	117.70	CO-BD	1	1	6	19810615

EFFORT 1 TORQUES: MIN= 123.10 AVG= 126.28 MAX= 130.00
EFFORT 2 TORQUES: MIN= 2.50 AVG= 58.94 MAX= 119.00

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
SB=BROKEN BIT STUCK IN RECESS ST=SCREW TURNED IN FIXTURE

NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS	END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
2201	.1900	STD RIB	10.00	0	1	100.70	CO	1	1	6	19810615
2202	.1900	STD RIB	10.00	0	2	93.90	CO	1	1	6	19810615
2203	.1900	STD RIB	10.00	0	1	113.70	CO	1	1	6	19810615
2204	.1900	STD RIB	10.00	0	2	64.90	CO	1	1	6	19810615
2205	.1900	STD RIB	10.00	0	1	118.50	CO	1	1	6	19810615
2206	.1900	STD RIB	10.00	0	2	89.60	CO	1	1	6	19810615
2207	.1900	STD RIB	10.00	0	1	118.60	CO	1	1	6	19810615
2208	.1900	STD RIB	10.00	0	2	52.20	CO	1	1	6	19810615
2209	.1900	STD RIB	10.00	0	1	112.60	CO	1	1	6	19810615
2210	.1900	STD RIB	10.00	0	2	99.40	CO	1	1	6	19810615
	EFFORT 1 TORQUES: MIN= 100.70 AVG= 112.82 MAX= 118.60										
	EFFORT 2 TORQUES: MIN= 52.20 AVG= 78.00 MAX= 93.90										
2301	.1900	RIB STD	10.00	0	1	87.90	CO	4	1	6	19810615
2302	.1900	RIB STD	10.00	0	2	5.50	CO	4	1	6	19810615
2303	.1900	RIB STD	10.00	0	1	102.50	CO	4	1	6	19810615
2304	.1900	RIB STD	10.00	0	2	8.40	CO	4	1	6	19810615
2305	.1900	RIB STD	10.00	0	1	102.10	CO	4	1	6	19810615
2306	.1900	RIB STD	10.00	0	2	9.60	CO	4	1	6	19810615
2307	.1900	RIB STD	10.00	0	1	98.20	CO	4	1	6	19810615
2308	.1900	RIB STD	10.00	0	2	8.20	CO	4	1	6	19810615
2309	.1900	RIB STD	10.00	0	1	98.80	CO	4	1	6	19810615
2310	.1900	RIB STD	10.00	0	2	6.10	CO	4	1	6	19810615
	EFFORT 1 TORQUES: MIN= 87.90 AVG= 97.90 MAX= 102.50										
	EFFORT 2 TORQUES: MIN= 5.50 AVG= 7.56 MAX= 9.60										
2401	.1900	STD STD	10.00	0	1	122.00	CO	4	1	6	19810615
2402	.1900	STD STD	10.00	0	2	97.90	CO	4	1	6	19810615
2403	.1900	STD STD	10.00	0	1	121.40	CO	4	1	6	19810615
2404	.1900	STD STD	10.00	0	2	92.30	CO	4	1	6	19810615
2405	.1900	STD STD	10.00	0	1	122.30	CO	4	1	6	19810615
2406	.1900	STD STD	10.00	0	2	96.40	CO	4	1	6	19810615
2407	.1900	STD STD	10.00	0	1	125.20	CO	4	1	6	19810615
2408	.1900	STD STD	10.00	0	2	106.90	CO	4	1	6	19810615
2409	.1900	STD STD	10.00	0	1	120.40	CO	4	1	6	19810615
2410	.1900	STD STD	10.00	0	2	97.30	CO	4	1	6	19810615
	EFFORT 1 TORQUES: MIN= 120.40 AVG= 122.26 MAX= 125.20										
	EFFORT 2 TORQUES: MIN= 92.30 AVG= 98.16 MAX= 106.90										

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
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NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS		END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
2501	.1900	RIB	STD	10.00	0	1	136.50	BB	6	1	6	19810615
2502	.1900	RIB	STD	10.00	0	2	0.00	SB	6	1	6	19810615
2503	.1900	RIB	STD	10.00	0	1	137.00	BB	6	1	6	19810615
2504	.1900	RIB	STD	10.00	0	2	0.00	SB	6	1	6	19810615
2505	.1900	RIB	STD	10.00	0	1	132.80	BB	6	1	6	19810615
2506	.1900	RIB	STD	10.00	0	2	127.40	BB	6	1	6	19810615
2507	.1900	RIB	STD	10.00	0	1	138.00	BB	6	1	6	19810615
2508	.1900	RIB	STD	10.00	0	2	0.00	SB	6	1	6	19810615
2509	.1900	RIB	STD	10.00	0	1	137.90	BB	6	1	6	19810615
2510	.1900	RIB	STD	10.00	0	2	130.20	BB	6	1	6	19810615

EFFORT 1 TORQUES: MIN= 132.80 AVG= 136.44 MAX= 138.00
EFFORT 2 TORQUES: MIN= 127.40 AVG= 128.80 MAX= 130.20

2601	.1900	STD	STD	10.00	0	1	115.50	CO	6	1	6	19810600
2602	.1900	STD	STD	10.00	0	2	75.00	CO	6	1	6	19810600
2603	.1900	STD	STD	10.00	0	1	121.30	CO	6	1	6	19810600
2604	.1900	STD	STD	10.00	0	2	80.80	CO	6	1	6	19810600
2605	.1900	STD	STD	10.00	0	1	115.00	CO	6	1	6	19810600
2606	.1900	STD	STD	10.00	0	2	79.40	CO	6	1	6	19810600
2607	.1900	STD	STD	10.00	0	1	123.60	CO	6	1	6	19810600
2608	.1900	STD	STD	10.00	0	2	27.00	CO	6	1	6	19810600
2609	.1900	STD	STD	10.00	0	1	122.10	CO	6	1	6	19810600
2610	.1900	STD	STD	10.00	0	2	48.00	CO	6	1	6	19810600

EFFORT 1 TORQUES: MIN= 115.00 AVG= 119.50 MAX= 123.60
EFFORT 2 TORQUES: MIN= 27.00 AVG= 62.04 MAX= 80.80

2701	.1900	RIB	STD	40.00	0	1	116.80	CO-BD	11	1	6	19810615
2702	.1900	RIB	STD	40.00	0	2	9.00	CO	11	1	6	19810615
2703	.1900	RIB	STD	40.00	0	1	119.20	CO-BD	11	1	6	19810615
2704	.1900	RIB	STD	40.00	0	2	17.00	CO	11	1	6	19810615
2705	.1900	RIB	STD	40.00	0	1	121.20	CO-BD	11	1	6	19810615
2706	.1900	RIB	STD	40.00	0	2	36.40	CO	11	1	6	19810615
2707	.1900	RIB	STD	40.00	0	1	114.90	CO-BD	11	1	6	19810615
2708	.1900	RIB	STD	40.00	0	2	15.10	CO	11	1	6	19810615
2709	.1900	RIB	STD	40.00	0	1	117.70	CO-BD	11	1	6	19810615
2710	.1900	RIB	STD	40.00	0	2	15.50	CO	11	1	6	19810615

EFFORT 1 TORQUES: MIN= 114.90 AVG= 117.96 MAX= 121.20
EFFORT 2 TORQUES: MIN= 9.00 AVG= 18.60 MAX= 36.40

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
SB=BROKEN BIT STUCK IN RECESS ST=SCREW TURNED IN FIXTURE

NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS		END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
2751	.1900	RIB	STD	40.00	0	1	108.75	CO	11	1	7	19810617
2752	.1900	RIB	STD	40.00	0	2	17.08	CO	11	1	7	19810617
2753	.1900	RIB	STD	40.00	0	1	107.45	CO	11	1	7	19810617
2754	.1900	RIB	STD	40.00	0	2	28.03	CO	11	1	7	19810617
2755	.1900	RIB	STD	40.00	0	1	101.84	CO	11	1	7	19810617
2756	.1900	RIB	STD	40.00	0	2	32.60	CO	11	1	7	19810617
2757	.1900	RIB	STD	40.00	0	1	104.58	CO	11	1	7	19810617
2758	.1900	RIB	STD	40.00	0	2	44.34	CO	11	1	7	19810617
2759	.1900	RIB	STD	40.00	0	1	111.23	CO	11	1	7	19810617
2760	.1900	RIB	STD	40.00	0	2	26.60	CO	11	1	7	19810617

EFFORT 1 TORQUES: MIN= 101.84 AVG= 106.77 MAX= 111.23
EFFORT 2 TORQUES: MIN= 17.08 AVG= 29.73 MAX= 44.34

2801	.1900	STD	STD	40.00	0	1	107.80	CO	11	1	6	19810625
2802	.1900	STD	STD	40.00	0	2	89.10	CO	11	1	6	19810625
2803	.1900	STD	STD	40.00	0	1	114.20	CO	11	1	6	19810625
2804	.1900	STD	STD	40.00	0	2	57.70	CO	11	1	6	19810625
2805	.1900	STD	STD	40.00	0	1	113.90	CO	11	1	6	19810625
2806	.1900	STD	STD	40.00	0	2	10.50	CO	11	1	6	19810625
2807	.1900	STD	STD	40.00	0	1	105.80	CO	11	1	6	19810625
2808	.1900	STD	STD	40.00	0	2	65.90	CO	11	1	6	19810625
2809	.1900	STD	STD	40.00	0	1	113.40	CO	11	1	6	19810625
2810	.1900	STD	STD	40.00	0	2	89.60	CO	11	1	6	19810625

EFFORT 1 TORQUES: MIN= 105.80 AVG= 111.02 MAX= 114.20
EFFORT 2 TORQUES: MIN= 10.50 AVG= 62.56 MAX= 89.60

2851	.1900	STD	STD	40.00	0	1	108.15	CO	11	1	7	19810617
2852	.1900	STD	STD	40.00	0	2	100.59	CO	11	1	7	19810617
2853	.1900	STD	STD	40.00	0	1	103.98	CO	11	1	7	19810617
2854	.1900	STD	STD	40.00	0	2	24.11	CO	11	1	7	19810617
2855	.1900	STD	STD	40.00	0	1	108.28	CO	11	1	7	19810617
2856	.1900	STD	STD	40.00	0	2	66.32	CO	11	1	7	19810617
2857	.1900	STD	STD	40.00	0	1	109.98	CO	11	1	7	19810617
2858	.1900	STD	STD	40.00	0	2	69.19	CO	11	.	7	19810617
2859	.1900	STD	STD	40.00	0	1	109.98	CO	11	1	7	19810617
2860	.1900	STD	STD	40.00	0	2	51.47	CO	11	1	7	19810617

EFFORT 1 TORQUES: MIN= 103.98 AVG= 108.07 MAX= 109.98
EFFORT 2 TORQUES: MIN= 24.11 AVG= 62.34 MAX= 100.59

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
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NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS		END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
2871	.1900	STD	STD	40.00	0	1	103.95	CO	11	1	7	19810625
2872	.1900	STD	STD	40.00	0	2	65.43	CO	11	1	7	19810625
2873	.1900	STD	STD	40.00	0	1	101.47	CO	11	1	7	19810625
2874	.1900	STD	STD	40.00	0	2	68.69	CO	11	1	7	19810625
2875	.1900	STD	STD	40.00	0	1	102.39	CO	11	1	7	19810625
2876	.1900	STD	STD	40.00	0	2	59.68	CO	11	1	7	19810625
2877	.1900	STD	STD	40.00	0	1	106.70	CO	11	1	7	19810625
2878	.1900	STD	STD	40.00	0	2	49.76	CO	11	1	7	19810625
2879	.1900	STD	STD	40.00	0	1	100.17	CO	11	1	7	19810625
2880	.1900	STD	STD	40.00	0	2	72.48	CO	11	1	7	19810625

EFFORT 1 TORQUES: MIN= 100.17 AVG= 102.94 MAX= 106.70
EFFORT 2 TORQUES: MIN= 49.76 AVG= 63.21 MAX= 72.48

2901	.1900	RIB	STD	20.00	0	1	118.70	CO-BD	11	1	6	19810615
2902	.1900	RIB	STD	20.00	0	2	8.40	CO	11	1	6	19810615
2903	.1900	RIB	STD	20.00	0	1	123.40	CO-BD	11	1	6	19810615
2904	.1900	RIB	STD	20.00	0	2	12.90	CO	11	1	6	19810615
2905	.1900	RIB	STD	20.00	0	1	116.10	CO-BD	11	1	6	19810615
2906	.1900	RIB	STD	20.00	0	2	20.80	CO	11	1	6	19810615
2907	.1900	RIB	STD	20.00	0	1	114.80	CO-BD	11	1	6	19810615
2908	.1900	RIB	STD	20.00	0	2	20.40	CO	11	1	6	19810615
2909	.1900	RIB	STD	20.00	0	1	114.70	CO-BD	11	1	6	19810615
2910	.1900	RIB	STD	20.00	0	2	9.50	CO	11	1	6	19810615

EFFORT 1 TORQUES: MIN= 114.70 AVG= 117.54 MAX= 123.40
EFFORT 2 TORQUES: MIN= 8.40 AVG= 14.40 MAX= 20.80

3001	.1900	STD	STD	20.00	0	1	117.50	CO	11	1	6	19810615
3002	.1900	STD	STD	20.00	0	2	17.20	CO	11	1	6	19810615
3003	.1900	STD	STD	20.00	0	1	104.90	CO	11	1	6	19810615
3004	.1900	STD	STD	20.00	0	2	11.70	CO	11	1	6	19810615
3005	.1900	STD	STD	20.00	0	1	113.60	CO	11	1	6	19810615
3006	.1900	STD	STD	20.00	0	2	10.00	CO	11	1	6	19810615
3007	.1900	STD	STD	20.00	0	1	100.40	CO	11	1	6	19810615
3008	.1900	STD	STD	20.00	0	2	22.00	CO	11	1	6	19810615
3009	.1900	STD	STD	20.00	0	1	103.80	CO	11	1	6	19810615
3010	.1900	STD	STD	20.00	0	2	62.00	CO	11	1	6	19810615

EFFORT 1 TORQUES: MIN= 100.40 AVG= 108.04 MAX= 117.50
EFFORT 2 TORQUES: MIN= 10.00 AVG= 24.58 MAX= 62.00

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
SB=BROKEN BIT STUCK IN RECESS ST=SCREW TURNED IN FIXTURE

NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS		END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
3101	.2500	RIB	STD	20.00	0	1	307.80	BB	12	1	6	19810600
3102	.2500	RIB	STD	20.00	0	2	276.00	CO	12	1	6	19810600
3103	.2500	RIB	STD	20.00	0	1	333.40	CO-BD	12	1	6	19810600
3104	.2500	RIB	STD	20.00	0	2	21.40	CO	12	1	6	19810600
3105	.2500	RIB	STD	20.00	0	1	308.40	CO-BD	12	1	6	19810600
3106	.2500	RIB	STD	20.00	0	2	8.30	CO	12	1	6	19810600
3107	.2500	RIB	STD	20.00	0	1	318.10	CO-BD	12	1	6	19810600
3108	.2500	RIB	STD	20.00	0	2	28.50	CO	12	1	6	19810600
3109	.2500	RIB	STD	20.00	0	1	325.10	CO-BD	12	1	6	19810600
3110	.2500	RIB	STD	20.00	0	2	7.10	CO	12	1	6	19810600

EFFORT 1 TORQUES: MIN= 307.80 AVG= 318.56 MAX= 333.40
EFFORT 2 TORQUES: MIN= 7.10 AVG= 68.26 MAX= 276.00

3151	.2500	RIB	STD	20.00	0	1	316.36	CO-BD	12	1	7	19810625
3152	.2500	RIB	STD	20.00	0	2	97.02	CO	12	1	7	19810625
3153	.2500	RIB	STD	20.00	0	1	321.05	CO	12	1	7	19810625
3154	.2500	RIB	STD	20.00	0	2	116.84	CO	12	1	7	19810625
3155	.2500	RIB	STD	20.00	0	1	319.88	CO-BD	12	1	7	19810625
3156	.2500	RIB	STD	20.00	0	2	96.11	CO	12	1	7	19810625
3157	.2500	RIB	STD	20.00	0	1	312.97	CO-BD	12	1	7	19810625
3158	.2500	RIB	STD	20.00	0	2	105.76	CO	12	1	7	19810625
3159	.2500	RIB	STD	20.00	0	1	299.14	CO	12	1	7	19810625
3160	.2500	RIB	STD	20.00	0	2	74.20	CO	12	1	7	19810625

EFFORT 1 TORQUES: MIN= 299.14 AVG= 313.88 MAX= 321.05
EFFORT 2 TORQUES: MIN= 74.20 AVG= 97.99 MAX= 116.84

3201	.2500	STD	STD	20.00	0	1	244.80	CO	12	1	6	19810615
3202	.2500	STD	STD	20.00	0	2	106.80	CO	12	1	6	19810615
3203	.2500	STD	STD	20.00	0	1	269.20	CO	12	1	6	19810615
3204	.2500	STD	STD	20.00	0	2	28.50	CO	12	1	6	19810615
3205	.2500	STD	STD	20.00	0	1	225.50	CO	12	1	6	19810615
3206	.2500	STD	STD	20.00	0	2	60.10	CO	12	1	6	19810615
3207	.2500	STD	STD	20.00	0	1	224.80	CO	12	1	6	19810615
3208	.2500	STD	STD	20.00	0	2	188.20	CO	12	1	6	19810615
3209	.2500	STD	STD	20.00	0	1	214.60	CO	12	1	6	19810615
3210	.2500	STD	STD	20.00	0	2	109.70	CO	12	1	6	19810615

EFFORT 1 TORQUES: MIN= 214.60 AVG= 235.78 MAX= 269.20
EFFORT 2 TORQUES: MIN= 28.50 AVG= 98.66 MAX= 188.20

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
SB=BROKEN BIT STUCK IN RECESS ST=SCREW TURNED IN FIXTURE

NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS		END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
3251	.2500	STD	STD	20.00	0	1	234.68	CO	12	2	7	19810600
3252	.2500	STD	STD	20.00	0	2	49.76	CO	12	2	7	19810600
3253	.2500	STD	STD	20.00	0	1	236.90	CO	12	2	7	19810600
3254	.2500	STD	STD	20.00	0	2	27.82	CO	12	2	7	19810600
3255	.2500	STD	STD	20.00	0	1	230.24	CO	12	2	7	19810600
3256	.2500	STD	STD	20.00	0	2	29.38	CO	12	2	7	19810600
3257	.2500	STD	STD	20.00	0	1	154.63	CO	12	2	7	19810600
3258	.2500	STD	STD	20.00	0	2	154.10	CO	12	2	7	19810600
3259	.2500	STD	STD	20.00	0	1	184.14	CO	12	2	7	19810600
3260	.2500	STD	STD	20.00	0	2	156.72	CO	12	2	7	19810600

EFFORT 1 TORQUES: MIN= 154.63 AVG= 208.12 MAX= 236.90
EFFORT 2 TORQUES: MIN= 27.82 AVG= 83.56 MAX= 156.72

3301	.1900	RIB	STD	20.00	0	1	141.30	BB	13	1	6	19810615
3302	.1900	RIB	STD	20.00	0	2	131.20	CO-BD	13	1	6	19810615
3303	.1900	RIB	STD	20.00	0	1	140.90	BB	13	1	6	19810615
3304	.1900	RIB	STD	20.00	0	2	136.30	BB	13	1	6	19810615
3305	.1900	RIB	STD	20.00	0	1	163.40	CO-BD	13	1	6	19810615
3306	.1900	RIB	STD	20.00	0	2	69.70	CO	13	1	6	19810615
3307	.1900	RIB	STD	20.00	0	1	143.70	BB	13	1	6	19810615
3308	.1900	RIB	STD	20.00	0	2	146.50	CO	13	1	6	19810615
3309	.1900	RIB	STD	20.00	0	1	150.90	BB	13	1	6	19810615
3310	.1900	RIB	STD	20.00	0	2	130.60	CO	13	1	6	19810615

EFFORT 1 TORQUES: MIN= 140.90 AVG= 148.04 MAX= 163.40
EFFORT 2 TORQUES: MIN= 69.70 AVG= 122.86 MAX= 146.50

3351	.1900	RIB	STD	20.00	0	1	116.71	CO	13	2	7	19810625
3352	.1900	RIB	STD	20.00	0	2	32.93	CO	13	2	7	19810625
3353	.1900	RIB	STD	20.00	0	1	123.38	BB	13	2	7	19810625
3354	.1900	RIB	STD	20.00	0	2	117.62	BB	13	2	7	19810625
3355	.1900	RIB	STD	20.00	0	1	116.84	CO	13	2	7	19810625
3356	.1900	RIB	STD	20.00	0	2	38.82	CO	13	2	7	19810625
3357	.1900	RIB	STD	20.00	0	1	115.93	CO	13	2	7	19810625
3358	.1900	RIB	STD	20.00	0	2	41.04	CO	13	2	7	19810625
3359	.1900	RIB	STD	20.00	0	1	113.70	CO-BD	13	2	7	19810625
3360	.1900	RIB	STD	20.00	0	2	61.95	CO	13	2	7	19810625

EFFORT 1 TORQUES: MIN= 113.70 AVG= 117.31 MAX= 123.38
EFFORT 2 TORQUES: MIN= 32.93 AVG= 58.47 MAX= 117.62

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
SB=BROKEN BIT STUCK IN RECESS ST=SCREW TURNED IN FIXTURE

NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS		END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
3401	.1900	STD	STD	20.00	0	1	125.60	CO	13	2	6	19810616
3402	.1900	STD	STD	20.00	0	2	65.80	CO	13	2	6	19810616
3403	.1900	STD	STD	20.00	0	1	126.00	BB	13	2	6	19810616
3404	.1900	STD	STD	20.00	0	2	121.60	CO	13	2	6	19810616
3405	.1900	STD	STD	20.00	0	1	123.50	CO	13	2	6	19810616
3406	.1900	STD	STD	20.00	0	2	38.80	CO	13	2	6	19810616
3407	.1900	STD	STD	20.00	0	1	110.40	CO	13	2	6	19810616
3408	.1900	STD	STD	20.00	0	2	85.60	CO	13	2	6	19810616
3409	.1900	STD	STD	20.00	0	1	126.90	CO	13	2	6	19810616
3410	.1900	STD	STD	20.00	0	2	62.20	CO	13	2	6	19810616

EFFORT 1 TORQUES: MIN= 110.40 AVG= 122.48 MAX= 126.90
EFFORT 2 TORQUES: MIN= 38.80 AVG= 74.80 MAX= 121.60

3451	.1900	STD	STD	20.00	0	1	126.94	CO	13	2	7	19810625
3452	.1900	STD	STD	20.00	0	2	39.96	CO	13	2	7	19810625
3453	.1900	STD	STD	20.00	0	1	124.98	CO	13	2	7	19810625
3454	.1900	STD	STD	20.00	0	2	48.97	CO	13	2	7	19810625
3455	.1900	STD	STD	20.00	0	1	121.19	CO	13	2	7	19810625
3456	.1900	STD	STD	20.00	0	2	25.34	CO	13	2	7	19810625
3457	.1900	STD	STD	20.00	0	1	118.06	CO	13	2	7	19810625
3458	.1900	STD	STD	20.00	0	2	71.17	CO	13	2	7	19810625
3459	.1900	STD	STD	20.00	0	1	118.32	BB	13	2	7	19810625
3460	.1900	STD	STD	20.00	0	2	115.06	BB	13	2	7	19810625

EFFORT 1 TORQUES: MIN= 118.06 AVG= 121.90 MAX= 126.94
EFFORT 2 TORQUES: MIN= 25.34 AVG= 60.10 MAX= 115.06

3501	.1900	RIB	STD	20.00	0	1	107.80	CO	14	1	6	19810616
3502	.1900	RIB	STD	20.00	0	2	15.50	CO	14	1	6	19810616
3503	.1900	RIB	STD	20.00	0	1	106.50	BB	14	1	6	19810616
3504	.1900	RIB	STD	20.00	0	2	99.40	CO-BD	14	1	6	19810616
3505	.1900	RIB	STD	20.00	0	1	112.80	CO-BD	14	1	6	19810616
3506	.1900	RIB	STD	20.00	0	2	11.90	CO	14	1	6	19810616
3507	.1900	RIB	STD	20.00	0	1	125.10	CO-BD	14	1	6	19810616
3508	.1900	RIB	STD	20.00	0	2	23.00	CO	14	1	6	19810616
3509	.1900	RIB	STD	20.00	0	1	124.80	CO-BD	14	1	6	19810616
3510	.1900	RIB	STD	20.00	0	2	9.30	CO	14	1	6	19810616

EFFORT 1 TORQUES: MIN= 106.50 AVG= 115.40 MAX= 125.10
EFFORT 2 TORQUES: MIN= 9.30 AVG= 31.82 MAX= 99.40

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
SB=BROKEN BIT STUCK IN RECESS ST=SCREW TURNED IN FIXTURE

NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS	END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
3551	.1900	RIB STD	20.00	0	1	108.62	CO-BD	14	2	7	19810619
3552	.1900	RIB STD	20.00	0	2	28.29	CO	14	2	7	19810619
3553	.1900	RIB STD	20.00	0	1	109.41	CO-BD	14	2	7	19810619
3554	.1900	RIB STD	20.00	0	2	16.82	CO	14	2	7	19810619
3555	.1900	RIB STD	20.00	0	1	118.79	CO	14	2	7	19810619
3556	.1900	RIB STD	20.00	0	2	27.64	CO	14	2	7	19810619
3557	.1900	RIB STD	20.00	0	1	93.11	CO	14	2	7	19810619
3558	.1900	RIB STD	20.00	0	2	38.21	CO	14	2	7	19810619
3559	.1900	RIB STD	20.00	0	1	110.45	CO	14	2	7	19810619
3560	.1900	RIB STD	20.00	0	2	17.99	CO	14	2	7	19810619

EFFORT 1 TORQUES: MIN= 99.11 AVG= 109.28 MAX= 118.79
EFFORT 2 TORQUES: MIN= 16.82 AVG= 25.79 MAX= 38.21

3571	.1900	RIB STD	20.00	0	1	115.19	CO-BD	14	2	7	19810616
3572	.1900	RIB STD	20.00	0	2	3.39	CO	14	2	7	19810616
3573	.1900	RIB STD	20.00	0	1	115.32	CO-BB	14	2	7	19810616
3574	.1900	RIB STD	20.00	0	2	112.97	CO	14	2	7	19810616
3575	.1900	RIB STD	20.00	0	1	91.94	CO	14	2	7	19810616
3576	.1900	RIB STD	20.00	0	2	14.37	CO	14	2	7	19810616
3577	.1900	RIB STD	20.00	0	1	113.88	CO	14	2	7	19810616
3578	.1900	RIB STD	20.00	0	2	15.28	CO	14	2	7	19810616
3579	.1900	RIB STD	20.00	0	1	112.70	BD	14	2	7	19810616
3580	.1900	RIB STD	20.00	0	2	90.12	CO	14	2		

EFFORT 1 TORQUES: MIN= 91.94 AVG= 109.81 MAX= 115.32
EFFORT 2 TORQUES: MIN= 3.39 AVG= 48.43 MAX= 112.97

3601	.1900	STD STD	20.00	0	1	106.20	CO	14	2	6	19810616
3602	.1900	STD STD	20.00	0	2	12.50	CO	14	2	6	19810616
3603	.1900	STD STD	20.00	0	1	108.00	CO	14	2	6	19810616
3604	.1900	STD STD	20.00	0	2	17.10	CO	14	2	6	19810616
3605	.1900	STD STD	20.00	0	1	112.00	CO	14	2	6	19810616
3606	.1900	STD STD	20.00	0	2	40.30	CO	14	2	6	19810616
3607	.1900	STD STD	20.00	0	1	106.80	CO	14	2	6	19810616
3608	.1900	STD STD	20.00	0	2	12.80	CO	14	2	6	19810616
3609	.1900	STD STD	20.00	0	1	107.40	CO	14	2	6	19810616
3610	.1900	STD STD	20.00	0	2	43.40	CO	14	2	6	19810616

EFFORT 1 TORQUES: MIN= 106.20 AVG= 108.08 MAX= 112.00
EFFORT 2 TORQUES: MIN= 12.50 AVG= 25.22 MAX= 43.40

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
SB=BROKEN BIT STUCK IN RECESS ST=SCREW TURNED IN FIXTURE

NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS		END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
3651	.1900	STD	STD	20.00	0	1	118.19	CO	14	2	7	19810625
3652	.1900	STD	STD	20.00	0	2	12.67	CO	14	2	7	19810625
3653	.1900	STD	STD	20.00	0	1	115.00	CO	14	2	7	19810625
3654	.1900	STD	STD	20.00	0	2	54.72	CO	14	2	7	19810625
3655	.1900	STD	STD	20.00	0	1	114.14	CO	14	2	7	19810625
3656	.1900	STD	STD	20.00	0	2	11.75	CO	14	2	7	19810625
3657	.1900	STD	STD	20.00	0	1	115.45	CO	14	2	7	19810625
3658	.1900	STD	STD	20.00	0	2	16.02	CO	14	2	7	19810625
3659	.1900	STD	STD	20.00	0	1	104.35	CO	14	2	7	19810625
3660	.1900	STD	STD	20.00	0	2	24.55	CO	14	2	7	19810625

EFFORT 1 TORQUES: MIN= 104.35 AVG= 113.43 MAX= 118.19
EFFORT 2 TORQUES: MIN= 11.75 AVG= 24.34 MAX= 54.72

3701	.2500	STD	STD	20.00	0	1	278.70	CO	15	2	6	19810616
3702	.2500	STD	STD	20.00	0	2	135.60	CO	15	2	6	19810616
3703	.2500	STD	STD	20.00	0	1	307.20	CO	15	2	6	19810616
3704	.2500	STD	STD	20.00	0	2	154.00	CO	15	2	6	19810616
3705	.2500	STD	STD	20.00	0	1	284.20	CO	15	2	6	19810616
3706	.2500	STD	STD	20.00	0	2	241.10	CO	15	2	6	19810616
3707	.2500	STD	STD	20.00	0	1	304.40	CO	15	2	6	19810616
3708	.2500	STD	STD	20.00	0	2	53.80	CO	15	2	6	19810616
3709	.2500	STD	STD	20.00	0	1	308.40	CO	15	2	6	19810616
3710	.2500	STD	STD	20.00	0	2	60.50	CO	15	2	6	19810616

EFFORT 1 TORQUES: MIN= 278.70 AVG= 296.58 MAX= 308.40
EFFORT 2 TORQUES: MIN= 53.80 AVG= 129.00 MAX= 241.10

3751	.2500	STD	STD	20.00	0	1	263.41	CO	15	2	7	19810625
3752	.2500	STD	STD	20.00	0	2	87.24	CO	15	2	7	19810625
3753	.2500	STD	STD	20.00	0	1	283.13	CO	15	2	7	19810625
3754	.2500	STD	STD	20.00	0	2	145.09	CO	15	2	7	19810625
3755	.2500	STD	STD	20.00	0	1	292.93	CO	15	2	7	19810625
3756	.2500	STD	STD	20.00	0	2	9.27	CO	15	2	7	19810625
3757	.2500	STD	STD	20.00	0	1	227.24	CO	15	2	7	19810625
3758	.2500	STD	STD	20.00	0	2	75.35	CO	15	2	7	19810625
3759	.2500	STD	STD	20.00	0	1	270.99	CO	15	2	7	19810625
3760	.2500	STD	STD	20.00	0	2	50.93	CO	15	2	7	19810625

EFFORT 1 TORQUES: MIN= 227.24 AVG= 267.54 MAX= 292.93
EFFORT 2 TORQUES: MIN= 9.27 AVG= 73.58 MAX= 145.09

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
SB=BROKEN BIT STUCK IN RECESS ST=SCREW TURNED IN FIXTURE

NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS	END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
3801	.2500	RIB STD	20.00	0	1	333.00	BB	15	2	6	19810616
3802	.2500	RIB STD	20.00	0	2	313.60	CO-BD	15	2	6	19810616
3803	.2500	RIB STD	20.00	0	1	330.00	CO-BD	15	2	6	19810616
3804	.2500	RIB STD	20.00	0	2	66.00	CO	15	2	6	19810616
3805	.2500	RIB STD	20.00	0	1	338.30	BB	15	2	6	19810616
3806	.2500	RIB STD	20.00	0	2	293.80	CO	15	2	6	19810616
3807	.2500	RIB STD	20.00	0	1	320.40	CO-BD	15	2	6	19810616
3808	.2500	RIB STD	20.00	0	2	37.70	CO	15	2	6	19810616
3809	.2500	RIB STD	20.00	0	1	341.90	BB	15	2	6	19810616
3810	.2500	RIB STD	20.00	0	2	324.60	BB	15	2		

EFFORT 1 TORQUES: MIN= 320.40 AVG= 332.72 MAX= 341.90
EFFORT 2 TORQUES: MIN= 37.70 AVG= 207.14 MAX= 324.60

3851	.2500	RIB STD	20.00	0	1	318.13	CO-BD	15	2	7	19810624
3852	.2500	RIB STD	20.00	0	2	88.67	CO	15	2	7	19810624
3853	.2500	RIB STD	20.00	0	1	250.48	CO-BD	15	2	7	19810624
3854	.2500	RIB STD	20.00	0	2	328.45	CO	15	2	7	19810624
3855	.2500	RIB STD	20.00	0	1	326.75	BB	15	2	7	19810624
3856	.2500	RIB STD	20.00	0	2	320.75	CO-BD	15	2	7	19810624
3857	.2500	RIB STD	20.00	0	1	325.71	BB	15	2	7	19810624
3858	.2500	RIB STD	20.00	0	2	228.67	CO-BD	15	2	7	19810624
3859	.2500	RIB STD	20.00	0	1	331.98	CO	15	2	7	19810624
3860	.2500	RIB STD	20.00	0	2	68.43	CO	15	2		

EFFORT 1 TORQUES: MIN= 250.48 AVG= 310.61 MAX= 331.98
EFFORT 2 TORQUES: MIN= 68.43 AVG= 206.99 MAX= 328.45

3901	.1900	RIB STD	20.00	0	1	138.90	CO-BD	16	1	6	19810616
3902	.1900	RIB STD	20.00	0	2	58.00	CO	16	1	6	19810616
3903	.1900	RIB STD	20.00	0	1	130.20	BB	16	1	6	19810616
3904	.1900	RIB STD	20.00	0	2	117.30	CO-BD	16	1	6	19810616
3905	.1900	RIB STD	20.00	0	1	132.10	BB	16	1	6	19810616
3906	.1900	RIB STD	20.00	0	2	81.90	BB	16	1	6	19810616
3907	.1900	RIB STD	20.00	0	1	130.80	BB	16	1	6	19810616
3908	.1900	RIB STD	20.00	0	2	111.40	BB	16	1	6	19810616
3909	.1900	RIB STD	20.00	0	1	131.60	BB	16	1	6	19810616
3910	.1900	RIB STD	20.00	0	2	115.10	BB	16	1		

EFFORT 1 TORQUES: MIN= 130.20 AVG= 132.72 MAX= 138.90
EFFORT 2 TORQUES: MIN= 58.00 AVG= 96.74 MAX= 117.30

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
SB=BROKEN BIT STUCK IN RECESS ST=SCREW TURNED IN FIXTURE

NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS		END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
3951	.1900	RIB	STD	20.00	0	1	104.29	CO	16	1	7	19810625
3952	.1900	RIB	STD	20.00	0	2	65.87	CO	16	1	7	19810625
3953	.1900	RIB	STD	20.00	0	1	95.54	CO	16	1	7	19810625
3954	.1900	RIB	STD	20.00	0	2	78.94	CO	16	1	7	19810625
3955	.1900	RIB	STD	20.00	0	1	101.94	CO	16	1	7	19810625
3956	.1900	RIB	STD	20.00	0	2	48.23	CO	16	1	7	19810625
3957	.1900	RIB	STD	20.00	0	1	68.22	CO	16	1	7	19810625
3958	.1900	RIB	STD	20.00	0	2	85.74	CO	16	1	7	19810625
3959	.1900	RIB	STD	20.00	0	1	106.77	CO	16	1	7	19810625
3960	.1900	RIB	STD	20.00	0	2	43.13	CO	16	1	7	19810625

EFFORT 1 TORQUES: MIN= 68.22 AVG= 95.35 MAX= 106.77
EFFORT 2 TORQUES: MIN= 43.13 AVG= 64.38 MAX= 85.74

4001	.1900	STD	STD	20.00	0	1	110.00	CO	16	1	6	19810616
4002	.1900	STD	STD	20.00	0	2	72.40	CO	16	1	6	19810616
4003	.1900	STD	STD	20.00	0	1	109.40	CO	16	1	6	19810616
4004	.1900	STD	STD	20.00	0	2	93.10	CO	16	1	6	19810616
4005	.1900	STD	STD	20.00	0	1	119.60	CO	16	1	6	19810616
4006	.1900	STD	STD	20.00	0	2	76.60	CO	16	1	6	19810616
4007	.1900	STD	STD	20.00	0	1	106.50	CO	16	1	6	19810616
4008	.1900	STD	STD	20.00	0	2	68.30	CO	16	1	6	19810616
4009	.1900	STD	STD	20.00	0	1	115.50	CO	16	1	6	19810616
4010	.1900	STD	STD	20.00	0	2	85.10	CO	16	1	6	19810616

EFFORT 1 TORQUES: MIN= 106.50 AVG= 112.20 MAX= 119.60
EFFORT 2 TORQUES: MIN= 68.30 AVG= 79.10 MAX= 93.10

4051	.1900	RIB	STD	20.00	0	1	116.67	BD-CO	16	1	7	19810625
4052	.1900	RIB	STD	20.00	0	2	51.75	CO	16	1	7	19810625
4053	.1900	RIB	STD	20.00	0	1	113.39	CO-BD	16	1	7	19810625
4054	.1900	RIB	STD	20.00	0	2	37.41	CO	16	1	7	19810625
4055	.1900	RIB	STD	20.00	0	1	103.59	CO	16	1	7	19810625
4056	.1900	RIB	STD	20.00	0	2	68.93	CO	16	1	7	19810625
4057	.1900	RIB	STD	20.00	0	1	110.65	BB	16	1	7	19810625
4058	.1900	RIB	STD	20.00	0	2	109.87	BD	16	1	7	19810625
4059	.1900	RIB	STD	20.00	0	1	115.09	CO	16	1	7	19810625
4060	.1900	RIB	STD	20.00	0	2	38.97	CO	16	1	7	19810625

EFFORT 1 TORQUES: MIN= 103.59 AVG= 111.88 MAX= 116.67
EFFORT 2 TORQUES: MIN= 37.41 AVG= 61.39 MAX= 109.87

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
SB=BROKEN BIT STUCK IN RECESS ST=SCREW TURNED IN FIXTURE

NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS		END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
4101	.1900	RIB	RIB	20.00	4	1	117.60	BB	1	1	6	19810606
4102	.1900	RIB	RIB	20.00	4	2	0.00	SB	1	1	6	19810606
4103	.1900	RIB	RIB	20.00	4	1	121.10	CO	1	1	6	19810606
4104	.1900	RIB	RIB	20.00	4	2	89.20	BB	1	1	6	19810606
4105	.1900	RIB	RIB	20.00	4	1	126.00	CO-BD	1	1	6	19810606
4106	.1900	RIB	RIB	20.00	4	2	5.30	CO	1	1	6	19810606
4107	.1900	RIB	RIB	20.00	4	1	122.90	BB	1	1	6	19810606
4108	.1900	RIB	RIB	20.00	4	2	122.10	CO-BD	1	1	6	19810606
4109	.1900	RIB	RIB	20.00	4	1	128.00	BB	1	1	6	19810606
4110	.1900	RIB	RIB	20.00	4	2	106.60	CO-BD	1	1	6	19810606

EFFORT 1 TORQUES: MIN= 117.60 AVG= 123.12 MAX= 128.00
EFFORT 2 TORQUES: MIN= 5.30 AVG= 80.80 MAX= 122.10

4151	.1900	RIB	RIB	20.00	4	1	121.99	CO-BD	1	1	7	19810606
4152	.1900	RIB	RIB	20.00	4	2	15.18	CO	1	1	7	19810606
4153	.1900	RIB	RIB	20.00	4	1	114.92	CO-BD	1	1	7	19810606
4154	.1900	RIB	RIB	20.00	4	2	22.91	CO	1	1	7	19810606
4155	.1900	RIB	RIB	20.00	4	1	114.79	CO-BD	1	1	7	19810606
4156	.1900	RIB	RIB	20.00	4	2	29.97	CO	1	1	7	19810606
4157	.1900	RIB	RIB	20.00	4	1	120.28	CO-BD	1	1	7	19810606
4158	.1900	RIB	RIB	20.00	4	2	29.84	CO	1	1	7	19810606
4159	.1900	RIB	RIB	20.00	4	1	119.76	CO-BD	1	1	7	19810606
4160	.1900	RIB	RIB	20.00	4	2	58.11	CO	1	1	7	19810606

EFFORT 1 TORQUES: MIN= 114.79 AVG= 118.35 MAX= 121.99
EFFORT 2 TORQUES: MIN= 15.18 AVG= 31.20 MAX= 58.11

4171	.1900	RIB	RIB	20.00	4	1	99.06	CO	1	1	7	19810606
4172	.1900	RIB	RIB	20.00	4	2	63.26	CO	1	1	7	19810606
4173	.1900	RIB	RIB	20.00	4	1	111.35	CO	1	1	7	19810606
4174	.1900	RIB	RIB	20.00	4	2	21.56	CO	1	1	7	19810606
4175	.1900	RIB	RIB	20.00	4	1	116.97	CO	1	1	7	19810606
4176	.1900	RIB	RIB	20.00	4	2	44.83	CO	1	1	7	19810606
4177	.1900	RIB	RIB	20.00	4	1	101.16	CO	1	1	7	19810606
4178	.1900	RIB	RIB	20.00	4	2	30.97	CO	1	1	7	19810606
4179	.1900	RIB	RIB	20.00	4	1	106.77	CO	1	1	7	19810606
4180	.1900	RIB	RIB	20.00	4	2	23.13	CO	1	1	7	19810606

EFFORT 1 TORQUES: MIN= 99.06 AVG= 107.06 MAX= 116.97
EFFORT 2 TORQUES: MIN= 21.56 AVG= 36.75 MAX= 63.26

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
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NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT	RECESS	END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
4201	.1900	STD	RIB	20.00	4	1	93.70	CO	1	1	6	19810606
4202	.1900	STD	RIB	20.00	4	2	62.60	CO	1	1	6	19810606
4203	.1900	STD	RIB	20.00	4	1	112.10	CO	1	1	6	19810606
4204	.1900	STD	RIB	20.00	4	2	42.00	CO	1	1	6	19810606
4205	.1900	STD	RIB	20.00	4	1	105.80	CO	1	1	6	19810606
4206	.1900	STD	RIB	20.00	4	2	40.90	CO	1	1	6	19810606
4207	.1900	STD	RIB	20.00	4	1	108.20	CO	1	1	6	19810606
4208	.1900	STD	RIB	20.00	4	2	79.40	CO	1	1	6	19810606
4209	.1900	STD	RIB	20.00	4	1	90.60	CO	1	1	6	19810606
4210	.1900	STD	RIB	20.00	4	2	78.10	CO	1	1	6	19810606
	EFFORT 1 TORQUES: MIN= 90.60 AVG= 102.08 MAX= 112.10											
	EFFORT 2 TORQUES: MIN= 40.90 AVG= 60.60 MAX= 79.40											
4301	.1900	RIB	STD	20.00	4	1	122.20	CO-BD	3	1	6	19810612
4302	.1900	RIB	STD	20.00	4	2	54.10	CO	3	1	6	19810612
4303	.1900	RIB	STD	20.00	4	1	124.10	BB	3	1	6	19810612
4304	.1900	RIB	STD	20.00	4	2	110.60	CO-BD	3	1	6	19810612
4305	.1900	RIB	STD	20.00	4	1	124.40	BB	3	1	6	19810612
4306	.1900	RIB	STD	20.00	4	2	104.40	CO-BD	3	1	6	19810612
4307	.1900	RIB	STD	20.00	4	1	124.00	CO-BD	3	1	6	19810612
4308	.1900	RIB	STD	20.00	4	2	24.20	CO	3	1	6	19810612
4309	.1900	RIB	STD	20.00	4	1	125.50	BB	3	1	6	19810612
4310	.1900	RIB	STD	20.00	4	2	107.20	CO-BD	3	1	6	19810612
	EFFORT 1 TORQUES: MIN= 122.20 AVG= 124.04 MAX= 125.50											
	EFFORT 2 TORQUES: MIN= 24.20 AVG= 80.10 MAX= 110.60											
4401	.1900	STD	STD	20.00	4	1	105.00	CO-BD	3	1	6	19810612
4402	.1900	STD	STD	20.00	4	2	59.20	CO	3	1	6	19810612
4403	.1900	STD	STD	20.00	4	1	103.00	CO-BD	3	1	6	19810612
4404	.1900	STD	STD	20.00	4	2	32.10	CO	3	1	6	19810612
4405	.1900	STD	STD	20.00	4	1	96.40	CO-BD	3	1	6	19810612
4406	.1900	STD	STD	20.00	4	2	8.40	CO	3	1	6	19810612
4407	.1900	STD	STD	20.00	4	1	100.60	CO-BD	3	1	6	19810612
4408	.1900	STD	STD	20.00	4	2	24.70	CO	3	1	6	19810612
4409	.1900	STD	STD	20.00	4	1	76.30	CO	3	1	6	19810612
4410	.1900	STD	STD	20.00	4	2	97.60	CO	3	1	6	19810612
	EFFORT 1 TORQUES: MIN= 76.30 AVG= 96.26 MAX= 105.00											
	EFFORT 2 TORQUES: MIN= 8.40 AVG= 44.40 MAX= 97.60											

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NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS		END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
4471	.1900	STD	STD	20.00	4	1	109.29	CO	3	1	7	19810606
4472	.1900	STD	STD	20.00	4	2	53.14	CO	3	1	7	19810606
4473	.1900	STD	STD	20.00	4	1	118.45	CO	3	1	7	19810606
4474	.1900	STD	STD	20.00	4	2	39.66	CO	3	1	7	19810606
4475	.1900	STD	STD	20.00	4	1	104.06	CO	3	1	7	19810606
4476	.1900	STD	STD	20.00	4	2	87.69	CO	3	1	7	19810606
4477	.1900	STD	STD	20.00	4	1	108.77	CO	3	1	7	19810606
4478	.1900	STD	STD	20.00	4	2	68.72	CO	3	1	7	19810606
4479	.1900	STD	STD	20.00	4	1	112.83	CO	3	1	7	19810606
4480	.1900	STD	STD	20.00	4	2	34.29	CO	3	1	7	19810606

EFFORT 1 TORQUES: MIN= 104.06 AVG= 110.68 MAX= 118.45
EFFORT 2 TORQUES: MIN= 34.29 AVG= 56.70 MAX= 87.69

4501	.1900	RIB	STD	20.00	4	1	79.20	CO-BD	4	1	6	19810612
4502	.1900	RIB	STD	20.00	4	2	4.60	CO	4	1	6	19810612
4503	.1900	RIB	STD	20.00	4	1	72.20	CO-BD	4	1	6	19810612
4504	.1900	RIB	STD	20.00	4	2	3.70	CO	4	1	6	19810612
4505	.1900	RIB	STD	20.00	4	1	71.00	CO-BD	4	1	6	19810612
4506	.1900	RIB	STD	20.00	4	2	3.90	CO	4	1	6	19810612
4507	.1900	RIB	STD	20.00	4	1	80.30	CO-BD	4	1	6	19810612
4508	.1900	RIB	STD	20.00	4	2	4.90	CO	4	1	6	19810612
4509	.1900	RIB	STD	20.00	4	1	85.10	CO-BD	4	1	6	19810612
4510	.1900	RIB	STD	20.00	4	2	3.60	CO	4	1	6	19810612

EFFORT 1 TORQUES: MIN= 71.00 AVG= 77.56 MAX= 85.10
EFFORT 2 TORQUES: MIN= 3.60 AVG= 4.14 MAX= 4.90

4571	.1900	RIB	STD	20.00	4	1	117.49	CO	4	1	7	19810606
4572	.1900	RIB	STD	20.00	4	2	49.01	CO	4	1	7	19810606
4573	.1900	RIB	STD	20.00	4	1	115.79	CO	4	1	7	19810606
4574	.1900	RIB	STD	20.00	4	2	27.31	CO	4	1	7	19810606
4575	.1900	RIB	STD	20.00	4	1	105.47	CO	4	1	7	19810606
4576	.1900	RIB	STD	20.00	4	2	113.54	CO	4	1	7	19810606
4577	.1900	RIB	STD	20.00	4	1	98.94	CO	4	1	7	19810606
4578	.1900	RIB	STD	20.00	4	2	19.47	CO	4	1	7	19810606
4579	.1900	RIB	STD	20.00	4	1	113.18	CO	4	1	7	19810606
4580	.1900	RIB	STD	20.00	4	2	50.97	CO	4	1	7	19810606

EFFORT 1 TORQUES: MIN= 98.94 AVG= 110.17 MAX= 117.49
EFFORT 2 TORQUES: MIN= 19.47 AVG= 52.06 MAX= 113.54

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
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NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT	RECESS	END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
4601	.1900	STD	STD	20.00	4	1	113.20	CO-BD	4	1	6	19810612
4602	.1900	STD	STD	20.00	4	2	44.80	CO	4	1	6	19810612
4603	.1900	STD	STD	20.00	4	1	105.10	CO-BD	4	1	6	19810612
4604	.1900	STD	STD	20.00	4	2	36.40	CO	4	1	6	19810612
4605	.1900	STD	STD	20.00	4	1	106.00	CO-BD	4	1	6	19810612
4606	.1900	STD	STD	20.00	4	2	50.10	CO	4	1	6	19810612
4607	.1900	STD	STD	20.00	4	1	102.00	CO-BD	4	1	6	19810612
4608	.1900	STD	STD	20.00	4	2	18.40	CO	4	1	6	19810612
4609	.1900	STD	STD	20.00	4	1	109.40	CO-BD	4	1	6	19810612
4610	.1900	STD	STD	20.00	4	2	22.80	CO	4	1	6	19810612

EFFORT 1 TORQUES: MIN= 102.00 AVG= 107.14 MAX= 113.20
EFFORT 2 TORQUES: MIN= 18.40 AVG= 34.50 MAX= 50.10

5101	.2500	RIB	STD	20.00	0	1	300.20	CO-BD	17	1	6	19810616
5102	.2500	RIB	STD	20.00	0	2	6.40	CO	17	1	6	19810616
5103	.2500	RIB	STD	20.00	0	1	297.40	CO-BD	17	1	6	19810616
5104	.2500	RIB	STD	20.00	0	2	19.70	CO	17	1	6	19810616
5105	.2500	RIB	STD	20.00	0	1	298.00	CO-BD	17	1	6	19810616
5106	.2500	RIB	STD	20.00	0	2	4.50	CO	17	1	6	19810616
5107	.2500	RIB	STD	20.00	0	1	294.90	CO-BD	17	1	6	19810616
5108	.2500	RIB	STD	20.00	0	2	6.40	CO	17	1	6	19810616
5109	.2500	RIB	STD	20.00	0	1	297.30	CO-BD	17	1	6	19810616
5110	.2500	RIB	STD	20.00	0	2	29.30	CO	17	1	6	19810616

EFFORT 1 TORQUES: MIN= 294.90 AVG= 297.56 MAX= 300.20
EFFORT 2 TORQUES: MIN= 4.50 AVG= 13.26 MAX= 29.30

5151	.2500	RIB	STD	20.00	0	1	228.24	CO-BD	17	2	7	19810625
5152	.2500	RIB	STD	20.00	0	2	256.95	CO	17	2	7	19810625
5153	.2500	RIB	STD	20.00	0	1	280.96	CO	17	2	7	19810625
5154	.2500	RIB	STD	20.00	0	2	137.94	CO	17	2	7	19810625
5155	.2500	RIB	STD	20.00	0	1	282.92	CO-BD	17	2	7	19810625
5156	.2500	RIB	STD	20.00	0	2	47.37	CO	17	2	7	19810625
5157	.2500	RIB	STD	20.00	0	1	296.76	CO-BD	17	2	7	19810625
5158	.2500	RIB	STD	20.00	0	2	136.50	CO	17	2	7	19810625
5159	.2500	RIB	STD	20.00	0	1	312.29	CO	17	2	7	19810625
5160	.2500	RIB	STD	20.00	0	2	61.46	CO	17	2	7	19810625

EFFORT 1 TORQUES: MIN= 228.24 AVG= 280.23 MAX= 312.29
EFFORT 2 TORQUES: MIN= 47.37 AVG= 128.04 MAX= 256.95

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NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS		END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
5201	.2500	STD	STD	20.00	0	1	254.50	CO-BD	17	1	6	19810616
5202	.2500	STD	STD	20.00	0	2	14.40	CO	17	1	6	19810616
5203	.2500	STD	STD	20.00	0	1	233.40	CO-BD	17	1	6	19810616
5204	.2500	STD	STD	20.00	0	2	22.80	CO	17	1	6	19810616
5205	.2500	STD	STD	20.00	0	1	209.10	CO-BD	17	1	6	19810616
5206	.2500	STD	STD	20.00	0	2	41.80	CO	17	1	6	19810616
5207	.2500	STD	STD	20.00	0	1	239.10	CO-BD	17	1	6	19810616
5208	.2500	STD	STD	20.00	0	2	75.60	CO	17	1	6	19810616
5209	.2500	STD	STD	20.00	0	1	210.60	CO-BD	17	1	6	19810616
5210	.2500	STD	STD	20.00	0	2	152.10	CO	17	1	6	19810616

EFFORT 1 TORQUES: MIN= 209.10 AVG= 229.34 MAX= 254.50
EFFORT 2 TORQUES: MIN= 14.40 AVG= 61.34 MAX= 152.10

5251	.2500	STD	STD	20.00	0	1	189.88	CO	17	1	7	19810625
5252	.2500	STD	STD	20.00	0	2	37.61	CO	17	1	7	19810625
5253	.2500	STD	STD	20.00	0	1	135.04	CO	17	1	7	19810625
5254	.2500	STD	STD	20.00	0	2	106.57	CO	17	1	7	19810625
5255	.2500	STD	STD	20.00	0	1	167.68	CO	17	1	7	19810625
5256	.2500	STD	STD	20.00	0	2	121.59	CO	17	1	7	19810625
5257	.2500	STD	STD	20.00	0	1	189.63	CO	17	1	7	19810625
5258	.2500	STD	STD	20.00	0	2	78.88	CO	17	1	7	19810625
5259	.2500	STD	STD	20.00	0	1	159.85	CO	17	1	7	19810625
5260	.2500	STD	STD	20.00	0	2	64.25	CO	17	1	7	19810625

EFFORT 1 TORQUES: MIN= 135.04 AVG= 168.42 MAX= 189.88
EFFORT 2 TORQUES: MIN= 37.61 AVG= 81.78 MAX= 121.59

5301	.1900	RIB	STD	20.00	0	1	132.00	BB	18	2	6	19810616
5302	.1900	RIB	STD	20.00	0	2	123.60	CO-BD	18	2	6	19810616
5303	.1900	RIB	STD	20.00	0	1	132.10	CO-BD	18	2	6	19810616
5304	.1900	RIB	STD	20.00	0	2	20.50	CO	18	2	6	19810616
5305	.1900	RIB	STD	20.00	0	1	100.20	CO	18	2	6	19810616
5306	.1900	RIB	STD	20.00	0	2	9.70	CO	18	2	6	19810616
5307	.1900	RIB	STD	20.00	0	1	129.10	CO-BD	18	2	6	19810616
5308	.1900	RIB	STD	20.00	0	2	33.20	CO	18	2	6	19810616
5309	.1900	RIB	STD	20.00	0	1	133.20	CO-BD	18	2	6	19810616
5310	.1900	RIB	STD	20.00	0	2	16.00	CO	18	2	6	19810616

EFFORT 1 TORQUES: MIN= 100.20 AVG= 125.32 MAX= 133.20
EFFORT 2 TORQUES: MIN= 9.70 AVG= 40.60 MAX= 123.60

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
SB=BROKEN BIT STUCK IN RECESS ST=SCREW TURNED IN FIXTURE

NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS		END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
5351	.1900	RIB	STD	20.00	0	1	105.39	CO-BD	18	1	7	19810619
5352	.1900	RIB	STD	20.00	0	2	22.20	CO	18	1	7	19810619
5353	.1900	RIB	STD	20.00	0	1	108.13	BB	18	1	7	19810619
5354	.1900	RIB	STD	20.00	0	2	112.31	BD-CO	18	1	7	19810619
5355	.1900	RIB	STD	20.00	0	1	104.35	CO	18	1	7	19810619
5356	.1900	RIB	STD	20.00	0	2	47.67	CO	18	1	7	19810619
5357	.1900	RIB	STD	20.00	0	1	95.49	CO	18	1	7	19810619
5358	.1900	RIB	STD	20.00	0	2	43.49	CO	18	1	7	19810619
5359	.1900	RIB	STD	20.00	0	1	96.51	CO	18	1	7	19810619
5360	.1900	RIB	STD	20.00	0	2	54.85	CO	18	1	7	19810619
EFFORT 1 TORQUES: MIN= 95.49 AVG= 101.97 MAX= 108.13												
EFFORT 2 TORQUES: MIN= 22.20 AVG= 56.10 MAX= 112.31												
5401	.1900	STD	STD	20.00	0	1	96.60	CO	18	1	6	19810616
5402	.1900	STD	STD	20.00	0	2	73.60	CO	18	1	6	19810616
5403	.1900	STD	STD	20.00	0	1	105.40	CO	18	1	6	19810616
5404	.1900	STD	STD	20.00	0	2	60.60	CO	18	1	6	19810616
5405	.1900	STD	STD	20.00	0	1	105.90	CO	18	1	6	19810616
5406	.1900	STD	STD	20.00	0	2	38.10	CO	18	1	6	19810616
5407	.1900	STD	STD	20.00	0	1	89.00	CO	18	1	6	19810616
5408	.1900	STD	STD	20.00	0	2	19.50	CO	18	1	6	19810616
5409	.1900	STD	STD	20.00	0	1	112.70	CO	18	1	6	19810616
5410	.1900	STD	STD	20.00	0	2	54.20	CO	18	1	6	19810616
EFFORT 1 TORQUES: MIN= 89.00 AVG= 101.92 MAX= 112.70												
EFFORT 2 TORQUES: MIN= 19.50 AVG= 51.20 MAX= 73.60												
5451	.1900	STD	STD	20.00	0	1	93.05	CO	18	1	7	19810625
5452	.1900	STD	STD	20.00	0	2	90.83	CO	18	1	7	19810625
5453	.1900	STD	STD	20.00	0	1	106.52	CO	18	1	7	19810625
5454	.1900	STD	STD	20.00	0	2	59.20	CO	18	1	7	19810625
5455	.1900	STD	STD	20.00	0	1	99.85	CO	18	1	7	19810625
5456	.1900	STD	STD	20.00	0	2	58.03	CO	18	1	7	19810625
5457	.1900	STD	STD	20.00	0	1	85.34	CO	18	1	7	19810625
5458	.1900	STD	STD	20.00	0	2	59.34	CO	18	1	7	19810625
5459	.1900	STD	STD	20.00	0	1	87.69	CO	18	1	7	19810625
5460	.1900	STD	STD	20.00	0	2	47.70	CO	18	1	7	19810625
EFFORT 1 TORQUES: MIN= 85.34 AVG= 94.49 MAX= 106.52												
EFFORT 2 TORQUES: MIN= 47.70 AVG= 63.02 MAX= 90.83												

MODE: CO=CAM OUT BB=BIT BROKEN BD=BIT DEFLECTED SS=SHANK SHEARED
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NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS	END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
6101	.1900	MAGNA TORX	20.00	0	1	103.00	BB	20	1	6	19810616 **
6102	.1900	MAGNA TORX	20.00	0	1	100.80	BB	20	1	6	19810616 **
6103	.1900	MAGNA TORX	20.00	0	1	103.30	BB	20	1	6	19810616 **
6104	.1900	MAGNA TORX	20.00	0	1	101.20	BB	20	1	6	19810616 **
6105	.1900	APEX TORX	20.00	0	1	107.70	CO-BD	20	1	6	19810616 **
6106	.1900	APEX TORX	20.00	0	1	55.30	CO	20	1	6	19810616 **
6107	.1900	MAGNA TORX	20.00	0	1	94.20	CO	20	1	6	19810616 **
	EFFORT 1 TORQUES: MIN= 55.30 AVG= 95.07 MAX= 107.70										
	EFFORT 2 TORQUES: MIN=1000.00 AVG= I MAX= 0.00										
6201	.1900	APEX TORX	20.00	0	1	88.90	CO	20	1	6	19810616
6202	.1900	APEX TORX	20.00	0	2	84.30	CO	20	1	6	19810616
6203	.1900	APEX TORX	20.00	0	1	102.90	CO	20	1	6	19810616
6204	.1900	APEX TORX	20.00	0	2	57.10	CO	20	1	6	19810616
6205	.1900	APEX TORX	20.00	0	1	109.90	CO	20	1	6	19810616
6206	.1900	APEX TORX	20.00	0	2	51.00	CO	20	1	6	19810616
6207	.1900	APEX TORX	20.00	0	1	110.80	CO	20	1	6	19810616
6208	.1900	APEX TORX	20.00	0	2	61.60	CO	20	1	6	19810616
6209	.1900	APEX TORX	20.00	0	1	106.30	CO	20	1	6	19810616
6210	.1900	APEX TORX	20.00	0	2	41.10	CO	20	1	6	19810616
	EFFORT 1 TORQUES: MIN= 88.90 AVG= 103.76 MAX= 110.80										
	EFFORT 2 TORQUES: MIN= 41.10 AVG= 59.02 MAX= 84.30										
6301	.1900	MAGNA TORX	20.00	0	1	102.30	BB	20	1	6	19810616
6302	.1900	MAGNA TORX	20.00	0	2	104.20	BB	20	1	6	19810616
6303	.1900	MAGNA TORX	20.00	0	1	102.30	BB	20	1	6	19810616
6304	.1900	MAGNA TORX	20.00	0	2	50.60	BB	20	1	6	19810616
6305	.1900	MAGNA TORX	20.00	0	1	103.70	BB	20	1	6	19810616
6306	.1900	MAGNA TORX	20.00	0	2	99.50	BB	20	1	6	19810616
6307	.1900	MAGNA TORX	20.00	0	1	102.60	BB	20	1	6	19810616
6308	.1900	MAGNA TORX	20.00	0	2	98.30	BB	20	1	6	19810616
6309	.1900	MAGNA TORX	20.00	0	1	100.20	BB	20	1	6	19810616
6310	.1900	MAGNA TORX	20.00	0	2	102.80	BB	20	1	6	19810616
	EFFORT 1 TORQUES: MIN= 100.20 AVG= 102.22 MAX= 103.70										
	EFFORT 2 TORQUES: MIN= 50.60 AVG= 91.08 MAX= 104.20										

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NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL
**=NEW BIT FOR EACH OF 7 TESTS

TEST NUMBER	DIAMETER INCHES	BIT-RECESS	END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
6351	.1900	MAGNA TORX	20.00	0	1	99.31	CO	20	1	7	19810616
6352	.1900	MAGNA TORX	20.00	0	2	98.14	CO	20	1	7	19810616
6353	.1900	MAGNA TORX	20.00	0	1	97.61	CO	20	1	7	19810616
6354	.1900	MAGNA TORX	20.00	0	2	97.09	CO	20	1	7	19810616
6355	.1900	MAGNA TORX	20.00	0	1	98.14	CO	20	1	7	19810616
6356	.1900	MAGNA TORX	20.00	0	2	99.44	CO	20	1	7	19810616
6357	.1900	MAGNA TORX	20.00	0	1	99.44	CO	20	1	7	19810616
6358	.1900	MAGNA TORX	20.00	0	2	99.44	CO	20	1	7	19810616
6359	.1900	MAGNA TORX	20.00	0	1	97.61	CO	20	1	7	19810616
6360	.1900	MAGNA TORX	20.00	0	2	97.22	CO	20	1	7	19810616
	EFFORT 1 TORQUES: MIN= 97.61 AVG= 98.42 MAX= 99.44										
	EFFORT 2 TORQUES: MIN= 97.09 AVG= 98.27 MAX= 99.44										
6401	.1900	MAGNA TORX	20.00	4	1	99.10	BB	20	1	6	19810616
6402	.1900	MAGNA TORX	20.00	4	2	99.10	BB	20	1	6	19810616
6403	.1900	MAGNA TORX	20.00	4	1	98.20	BB	20	1	6	19810616
6404	.1900	MAGNA TORX	20.00	4	2	99.50	BB	20	1	6	19810616
6405	.1900	MAGNA TORX	20.00	4	1	96.10	BB	20	1	6	19810616
6406	.1900	MAGNA TORX	20.00	4	2	99.20	BB	20	1	6	19810616
6407	.1900	MAGNA TORX	20.00	4	1	94.60	BB	20	1	6	19810616
6408	.1900	MAGNA TORX	20.00	4	2	100.50	BB	20	1	6	19810616
6409	.1900	MAGNA TORX	20.00	4	1	99.20	BB	20	1	6	19810616
6410	.1900	MAGNA TORX	20.00	4	2	97.70	BB	20	1	6	19810616
	EFFORT 1 TORQUES: MIN= 94.60 AVG= 97.44 MAX= 99.20										
	EFFORT 2 TORQUES: MIN= 97.70 AVG= 99.20 MAX= 100.50										
6501	.1900	APEX TORX	20.00	0	1	90.60	CO	20	1	6	19810600
6502	.1900	APEX TORX	20.00	0	2	44.60	CO	20	1	6	19810600
6503	.1900	APEX TORX	20.00	0	1	101.10	CO	20	1	6	19810600
6504	.1900	APEX TORX	20.00	0	2	22.10	CO	20	1	6	19810600
6505	.1900	APEX TORX	20.00	0	1	86.50	CO	20	1	6	19810600
6506	.1900	APEX TORX	20.00	0	2	65.40	CO	20	1	6	19810600
6507	.1900	APEX TORX	20.00	0	1	90.20	CO	20	1	6	19810600
6508	.1900	APEX TORX	20.00	0	2	51.70	CO	20	1	6	19810600
6509	.1900	APEX TORX	20.00	0	1	102.00	CO	20	1	6	19810600
6510	.1900	APEX TORX	20.00	0	2	45.70	CO	20	1	6	19810600
	EFFORT 1 TORQUES: MIN= 86.50 AVG= 94.08 MAX= 102.00										
	EFFORT 2 TORQUES: MIN= 22.10 AVG= 45.90 MAX= 65.40										

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NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS	END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
8001	.1900	MAGNA TORX	40.00	0	1	98.30	BB	20	1	7	19810803
8002	.1900	MAGNA TORX	40.00	0	2	99.35	BB	20	1	7	19810803
8003	.1900	MAGNA TORX	40.00	0	1	99.21	BB	20	1	7	19810803
8004	.1900	MAGNA TORX	40.00	0	2	102.49	BB	20	1	7	19810803
8005	.1900	MAGNA TORX	40.00	0	1	97.78	BB	20	1	7	19810803
8006	.1900	MAGNA TORX	40.00	0	2	98.50	BB	20	1	7	19810803
8007	.1900	MAGNA TORX	40.00	0	1	99.35	BB	20	1	7	19810803
8008	.1900	MAGNA TORX	40.00	0	2	98.30	BB	20	1	7	19810803

EFFORT 1 TORQUES: MIN= 97.78 AVG= 98.66 MAX= 99.35
EFFORT 2 TORQUES: MIN= 98.30 AVG= 99.66 MAX= 102.49

8101	.1900	APEX TORX	40.00	0	1	96.63	CO	20	1	7	19810804
8102	.1900	APEX TORX	40.00	0	2	65.60	CO	20	1	7	19810804
8103	.1900	APEX TORX	40.00	0	1	97.28	CO	20	1	7	19810804
8104	.1900	APEX TORX	40.00	0	2	37.70	CO	20	1	7	19810804
8105	.1900	APEX TORX	40.00	0	1	92.06	CO	20	1	7	19810804
8106	.1900	APEX TORX	40.00	0	2	32.86	CO	20	1	7	19810804
8107	.1900	APEX TORX	40.00	0	1	88.28	CO	20	1	7	19810804
8108	.1900	APEX TORX	40.00	0	2	76.67	CO	20	1	7	19810804
8109	.1900	APEX TORX	40.00	0	1	89.07	CO	20	1	7	19810804
8110	.1900	APEX TORX	40.00	0	2	63.64	CO	20	1	7	19810804

EFFORT 1 TORQUES: MIN= 88.28 AVG= 92.66 MAX= 97.28
EFFORT 2 TORQUES: MIN= 32.86 AVG= 55.29 MAX= 76.67

8201	.1900	APEX TORX	20.00	0	1	84.89	CO	20	1	7	19810804
8202	.1900	APEX TORX	20.00	0	2	39.77	CO	20	1	7	19810804
8203	.1900	APEX TORX	20.00	0	1	80.07	CO	20	1	7	19810804
8204	.1900	APEX TORX	20.00	0	2	33.51	CO	20	1	7	19810804
8205	.1900	APEX TORX	20.00	0	1	85.64	CO	20	1	7	19810804
8206	.1900	APEX TORX	20.00	0	2	57.77	CO	20	1	7	19810804
8207	.1900	APEX TORX	20.00	0	1	83.71	CO	20	1	7	19810804
8208	.1900	APEX TORX	20.00	0	2	44.56	CO	20	1	7	19810804
8209	.1900	APEX TORX	20.00	0	1	86.85	CO	20	1	7	19810804
8210	.1900	APEX TORX	20.00	0	2	34.16	CO	20	1	7	19810804

EFFORT 1 TORQUES: MIN= 80.07 AVG= 84.23 MAX= 86.85
EFFORT 2 TORQUES: MIN= 33.51 AVG= 41.95 MAX= 57.77

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NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS	END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
8301	.1900	APEX TORX	20.00	4	1	73.18	CO	20	1	7	19810804
8302	.1900	APEX TORX	20.00	4	2	65.98	CO	20	1	7	19810804
8303	.1900	APEX TORX	20.00	4	1	86.98	CO	20	1	7	19810804
8304	.1900	APEX TORX	20.00	4	2	47.53	CO	20	1	7	19810804
8305	.1900	APEX TORX	20.00	4	1	63.02	CO	20	1	7	19810804
8306	.1900	APEX TORX	20.00	4	2	32.03	CO	20	1	7	19810804
8307	.1900	APEX TORX	20.00	4	1	77.34	CO	20	1	7	19810804
8308	.1900	APEX TORX	20.00	4	2	45.96	CO	20	1	7	19810804
8309	.1900	APEX TORX	20.00	4	1	69.79	CO	20	1	7	19810804
8310	.1900	APEX TORX	20.00	4	2	34.76	CO	20	1	7	19810804

EFFORT 1 TORQUES: MIN= 63.02 AVG= 74.06 MAX= 86.98
EFFORT 2 TORQUES: MIN= 32.03 AVG= 45.25 MAX= 65.98

9001	.2500	MAGNA TORX	20.00	0	1	256.88	BB	19	1	7	19810803
9002	.2500	MAGNA TORX	20.00	0	2	256.88	CO	19	1	7	19810803
9003	.2500	MAGNA TORX	20.00	0	1	260.80	CO	19	1	7	19810803
9004	.2500	MAGNA TORX	20.00	0	2	54.02	CO	19	1	7	19810803
9005	.2500	MAGNA TORX	20.00	0	1	257.27	CO	19	1	7	19810803
9006	.2500	MAGNA TORX	20.00	0	2	28.64	CO	19	1	7	19810803
9007	.2500	MAGNA TORX	20.00	0	1	264.07	CO	19	1	7	19810803
9008	.2500	MAGNA TORX	20.00	0	2	33.48	CO	19	1	7	19810803
9009	.2500	MAGNA TORX	20.00	0	1	270.48	CO	19	1	7	19810803
9010	.2500	MAGNA TORX	20.00	0	2	22.78	CO	19	1	7	19810803

EFFORT 1 TORQUES: MIN= 256.88 AVG= 261.90 MAX= 270.48
EFFORT 2 TORQUES: MIN= 22.78 AVG= 79.16 MAX= 256.88

9101	.2500	MAGNA TORX	20.00	4	1	226.85	CO	19	1	7	19810803
9102	.2500	MAGNA TORX	20.00	4	2	39.44	CO	19	1	7	19810803
9103	.2500	MAGNA TORX	20.00	4	1	211.31	BB	19	1	7	19810803
9104	.2500	MAGNA TORX	20.00	4	2	17.11	CO	19	1	7	19810803
9105	.2500	MAGNA TORX	20.00	4	1	240.29	CO	19	1	7	19810803
9106	.2500	MAGNA TORX	20.00	4	2	14.63	CO	19	1	7	19810803
9107	.2500	MAGNA TORX	20.00	4	1	221.36	CO	19	1	7	19810803
9108	.2500	MAGNA TORX	20.00	4	2	16.19	CO	19	1	7	19810803
9109	.2500	MAGNA TORX	20.00	4	1	224.23	CO	19	1	7	19810803
9110	.2500	MAGNA TORX	20.00	4	2	124.72	CO	19	1	7	19810903

EFFORT 1 TORQUES: MIN= 211.31 AVG= 224.81 MAX= 240.29
EFFORT 2 TORQUES: MIN= 14.63 AVG= 42.42 MAX= 124.72

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NOTES: MAT 1 = CADMIUM PLATED ALLOY STEEL MAT 2 = A-286 STAINLESSS STEEL

TEST NUMBER	DIAMETER INCHES	BIT-RECESS	END LOAD POUNDS	ANGLE DEGREES	EFFORT	FAILURE TORQUE LB-IN	FAILURE MODE	LOT	MAT	CHANNEL	TEST DATE YEARMODA
9151	.2500	MAGNA TORX	40.00	0	1	260.14	BB	19	1	7	19810804
9152	.2500	MAGNA TORX	40.00	0	2	258.31	BB	19	1	7	19810804
9153	.2500	MAGNA TORX	40.00	0	1	267.22	BB	19	1	7	19810804
9154	.2500	MAGNA TORX	40.00	0	2	238.80	BB	19	1	7	19810804

EFFORT 1 TORQUES: MIN= 260.14 AVG= 263.68 MAX= 267.22
EFFORT 2 TORQUES: MIN= 238.80 AVG= 248.56 MAX= 258.31

TOTAL NUMBER OF TESTS LISTED IN THIS TABULATION= 1117
TOTAL NUMBER OF GROUPS LISTED IN THIS TABULATION= 103

DISTRIBUTION LIST

DOD AND OTHER GOVERNMENT ORGANIZATIONS

ASD/ENFEM (Mr. R. P. Stewart)
WPAFB OH 45433

ASD/ENESS
WPAFB OH 45433

ASD/ENFS
WPAFB OH 45433

ASD/ENFZ
WPAFB OH 45433

ASD/B1EFS (Wm Geese)
WPAFB OH 45433

ASD/AFEF (Tom Oole)
WPAFB OH 45433

ASD/TAFE (John Hutson)
WPAFB OH 45433

ASD/YPEF (Don Russell)
WPAFB OH 45433

ASD/RWEF (E. Eisert)
WPAFB OH 45433

AFWAL/MLSA (Mr. Robert Urzi)
WPAFB OH 45433

AFWAL/MLSA (Neal Ontko)
WPAFB OH 45433

AFWAL/FIBE (Mr. John Potter)
WPAFB OH 45433

AF ALD/PTEE (Fred Dellostritto)
WPAFB OH 45433

AFWAL/TST
WPAFB OH 45433

4950TW/AMDS (Marvin Lindamood)
WPAFB OH 45433

CASD/LODSHD
Ernest Vega
Federal Center
Battle Creek MI 49016

MCLDDP
WPAFB OH 45433

HQ AFLC/MAUT (Mr. Larry Marler)
WPAFB OH 45433

HQ AFSC/ALXP (Clark Walker)
Andrews AFB MD 20334

HQ AFSC/SDTA
Major Frank Mayo
Andrews AFB MD 20334

HQ USAF/RDPT
Major John Delauche
Pentagon
Washington D.C. 20330

AUK/LSE
Maxwell AFB AL 36112

WR-ALC/MMIRDA
Mr. E. Rose
Robins AFB GA 31093

WR-ALC/MMSRBA
Mr. Jim Peale
Robins AFB GA 31093

SM/ALC/MMSR (Bill Southerland)
McClellan AFB CA 95652

AF SA/ALC/MMIRCC (Art Laback)
Kelly AFB TX 78241

HQ MAC/LGMM
Scott AFB IL 62225

HQ TAC/LGMM
Langley AFB VA 23365

HQ SAC/LGMM
Offutt AFB NE 68113

USA Armament R&D Command
ORDAR-TST-S (M. E. Taylor)
Dover NJ 07801

USA Aviation R&D Command
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